CONTEXT V: MULTI-PROGRAM RESEARCH: 1971-PRESENT

SubTheme: *Reactor Testing, Experimentation, and Development*
INEEL Area: Central Facilities Area

CFA and Changing Missions: 1970s-Present

Political upheavals during the 1970s affected how government controlled the nuclear industry. The AEC was abolished, replaced briefly with the Energy Research and Development Administration (ERDA), and then by the Department of Energy (DOE) in 1977. The NRTS changed its name to Idaho National Engineering Laboratory (INEL) in 1974, emphasizing its status as a national laboratory.[1] New environmental laws, the energy crisis, and nuclear power plant accidents obliged the INEL to focus its resources on energy efficiency, nuclear waste cleanup and increased worker safety requirements.

EG&G became the primary Maintenance and Operations contractor of the INEL in 1976. Until about 1979, very little new construction had taken place at CFA -- a few additional storage facilities, utility buildings, and craft shops. Then the pace quickened. In 1979, a new High Bay Lab (CFA-686) and office buildings for Morrison-Knudsen and EG&G were constructed. The old hot laundry facility was remodeled to meet DOE standards for energy efficiency.

Similar changes occurred in the 1980s. New office buildings were needed to deal with health and safety issues: office buildings (CFA-612 and -614), and Hazardous Waste Storage Facility Field Offices (CFA-655). New multicraft shops replaced several outdated facilities.

By 1990 several CFA buildings were forty years old or more. The DOE site manager decided to dismantle many old structures and replace them with new ones. The quality of construction and the heavy-duty materials in the older structures created challenges for dismantlement teams. Those composed of reinforced concrete, especially the structures at the NPG Proof Area, were constructed with rebar that was typically doubled and crisscrossed. Asbestos insulation covered many old pipes and walls. Buried fuel tanks, contaminated water pipes, drainage pumps, and entire buildings required special handling. In the Proof Area, old naval ordnance had to be found and recovered.

Between 1990 and 1995, two new buildings appeared at

[1] Stacy, *Proving the Principle*, p. 217-218.

the CFA: the Core Storage Library (CFA-663), in which geological core samples were stored by the United States Geological Service; and a new office complex called Office #3 (CFA-615).

Beginning in 1995, after Lockheed Technologies became the consolidated contractor for the INEL, construction continued. Several old facilities were replaced and new ones constructed in connection with waste processing activities. Most were prefabricated metal structures. A new Transportation Complex (CFA-696), Medical Dispensary (CFA-1612), Fire Station, pumphouse and concrete-slab training facility (CFA-1611, -1603, -1606), and more offices (CFA-1608 through -1610) were completed. New chlorine injection facilities (CFA-1601) and waste water labs (CFA-1605) reflected the INEL's emphasis on environmental remediation. A Health Physics Instrument Laboratory (CFA-1618) was completed in 2002.[2]

Significance

As a centralized service center for contractors elsewhere at the INEEL, the CFA typically was not the scene of scientific discovery or historic breakthroughs in nuclear knowledge. Its labs, shops, transportation terminals, personnel services, storage warehouses, utility centers, and administrative offices all supported experiments elsewhere. As scientific inquiry shifted from nuclear reactor concepts and safety to waste remediation, CFA facilities shifted the burden of their support accordingly. Compelling demands by DOE to operate with energy efficiency and without excessive maintenance costs dictated that obsolete buildings be replaced.

Aside from changing missions, the extant buildings at CFA also reflect national trends in industrial vernacular architecture. When DOE mandated that all of its facilities reduce their energy consumption after the oil shortages of the early 1970s, vendors had to supply buildings that would meet new energy efficiency standards at costs low enough to win bids. Invariably this meant that pumice block, wood frame, and brick veneered buildings became a thing of the past. Prefabricated all-metal buildings tended to meet construction and energy conservation standards at lower costs.

Office buildings CFA-612 and CFA-614, built in the

[2] Hollie Gilbert, "Building/Structure" Data Base, 2003 version.

1980s, are among the few buildings on the entire INEEL site to meld a defined architectural style (International and Contemporary) with the functional nature of industrial structures.

The blending of old NPG military structures in a setting with later nuclear-era buildings offers a rare opportunity to examine a landscape shaped by the federal government and its civilian contractors. The CFA exhibits the adaptation and reuse of military buildings and residences. The contrast between the Navy's approach to housing its employees on-site -- providing them with permanent housing, landscaping, and trees -- contrasts sharply with the AEC's determination not to house its employees on- or off-site and not to construct permanent buildings. Yet both the Navy and AEC were engaged in government-financed scientific experimentation and testing. Each created similar clustering of activity in this desert environment.

Because of the rarity of World War-II era military housing located in its original site, the extant NPG buildings are recommended for HABS/HAER-level documentation. These buildings are also historically significant because the NPG was one of only a few sites in the United States where military weapons research occurred and one of the few military sites of any kind in Idaho. They have survived adaptation and reuse in the nuclear era.

SubTheme: *Reactor Testing, Experimentation, and Development*
INEEL Area: Argonne National Laboratory West

The End of the Liquid Metal Fast Breeder Reactor (LMFBR)

As mentioned earlier in Context IV, the AEC altered its reactor development objectives radically around 1965. Instead of continuing research on many different reactor concepts, the AEC selected one concept for further development -- the LMFBR. This development tended to quench the start-up of new testing experiments at the NRTS in general, but some of the research on the LMFBR continued to involve Argonne West (ANL-West).

By 1970, LMFBR supporters felt ready to demonstrate the concept. They planned for the Clinch River Breeder Reactor (CRBR), to be located in Tennessee. It would be the joint effort of the AEC and a consortium of 700 private utility companies. The project would finally, it was hoped, prove the feasibility and safety of the LMFBR for commercial power production. The concept promised to breed plutonium fuel at a rate to double the initial fuel input in eight to ten years of operation. After years of debate and promotion, the federal government and the consortium companies committed funds for the project.[3]

The plan to build CRBR had developed despite the fact that Detroit Edison's small commercial breeder, the Enrico Fermi, shut down in 1972. The Fermi reactor had suffered a meltdown in 1966 when a metal plate below the core broke off and blocked the coolant flow. The reactor was repaired and continued operating until its fuel was depleted.

Other national forces, however, conspired to prevent the CRBR from being built, although site preparation was initiated in 1983. High demand for electrical power, which utility companies and the AEC had been predicting for years, did not materialize. Consumers responded to energy shortages in the early 1970s by reducing their use of electricity. Fossil fuels were not being depleted as quickly as had been predicted, and new sources of supply were discovered. Segments of the public began to worry that terrorists or "rogue states" might acquire plutonium for weapons. The 1979 accident at Three Mile Island -- and, many scientists believe, the inaccurate and incomplete way in which information about it was delivered to the public -- aroused fears among other citizens that nuclear power plants were unreasonably dangerous.[4]

In this atmosphere, critics of the Clinch River project became more vocal and organized. Even among those who supported nuclear power, there were questions as to whether it was the best demonstration plant. The reactor was based on early designs, and some scientists, including nuclear pioneer Walter Zinn, believed that the CRBR design was obsolete. In their view, the demonstration would be neither efficient nor cost effective. Design changes, regulatory compliance, and the passage of time all increased the costs of building the reactor. Although the funding for CRBR survived years of budget battles in Congress, private support weakened. In 1983, Congress canceled the funding.[5]

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[3] William Lanouette, "Dream Machine," *Atlantic Monthly* (April 1983), p. 48-52.

[4] See Stacy, *Proving the Principle*, chapters 23 and 24, "The Endowment of Uranium" and "The Uranium Trail Fades," for a synopsis of the impact of world events on the nuclear enterprise in Idaho, p. 222-243.

[5] "Breeder Program: Bethe Panel Calls for Reorientation," *Science* (182:1236), p. 1237; Lanouette, p. 46-52.

The Integral Fast Reactor Concept (IFR): 1984-1994

Research at ANL-West facilities contributed to the LMFBR program up until 1983, although ANL-West funding was not tied directly to the Clinch River project. The public's concerns about plutonium theft and, after the accident at Three Mile Island, power plant safety -- along with a universal concern for effective methods of handling nuclear waste -- inspired ANL to redirect its research goals.

Scientists and engineers at ANL had been considering a new breeder reactor concept named the Integral Fast Reactor (IFR). By 1984 the IFR had become ANL's new priority in reactor development, with tests and research centered at ANL-West. The project grew steadily. By 1994 employment levels at ANL-West reached a peak of about 850 people.[6]

Argonne was so interested in the IFR because it seemed to overcome many public concerns: its safety was derived from the operation of laws of nature, not the absence of human error; its fuel cycle reduced the volume of waste and the length of time it would be a hazard; and the nature of the residual plutonium was not in a form attractive for diversion to weapons. IFR proponents hoped to fulfill the early promise of nuclear energy for the peaceful and economic generation of electricity.[7]

The fuel for the IFR was a metallic fuel (in contrast to the ceramic fuel typically used in commercial reactors) with high thermal conductivity. The processing of spent fuel elements, which could be accomplished on-site without shipping the material to a processing plant, separated the unused fuel from most of the other waste, making the waste less highly radioactive than conventional spent fuel. Scientists hoped that the IFR, with this "closed" fuel cycle might ease public concerns about transporting nuclear fuels and wastes.[8]

Testing of the new fuel elements took place at ANL-West. The fuel, a combination of uranium, plutonium, and zirconium, appeared to perform more safely, economically, and efficiently than earlier designs. The fuel had greater

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[6] "Argonne Proposes `Proliferation-resistant' breeder," *Physics Today* (August 1984), p. 62; Holl, p. 446; Lindsay, personal communication, Sept. 16, 1997.

[7] Stacy, *Proving the Principle*, p. 232-237.

[8] At ANL-West, EBR-II and the Fuel Cycle Facility (FCF) were modified. The changes made power production, fuel reprocessing, and waste treatment possible at a single location. See Holl, p. 445-446.

thermal conductivity than earlier fuels and could transfer heat from the center of the reactor to the coolant more efficiently. This improved safety, because if heat should build up in the core, the fuel elements would expand, slowing the fission reaction, and resulting in a natural shut-down of the chain reaction.

The new "integral" fuel recycling process also added to efficiency and safety. It produced a conglomerate of plutonium, uranium, and other heavier-than-uranium elements that could be refabricated into new fuel elements in special hot cells located near the reactor. The ANL-West scientists believed this system could neutralize the threat of plutonium theft. Weapons production requires a supply of "pure" plutonium which could not be obtained from IFR fuel without additional reprocessing. Separating the plutonium from the highly radioactive mix would require heavy investment in very large facilities that would be difficult to hide.

In April 1986, the scientists at ANL-West loaded up the EBR-II reactor with IFR fuel and conducted a Loss of Flow Test and a Loss of Heat Sink Test to simulate a complete station blackout and a loss of ability to remove heat from the core. In both tests, no operator interventions or emergency safety systems were brought into action. The reactor shut itself down because of the natural laws of physics, not a set of human-engineered or human-operated safety procedures.[9]

Three weeks after ANL-West's 1986 tests, an explosion occurred at the Chernobyl nuclear power plant in the Soviet Union. The alarming accident released substantial radiation into the environment and reinforced the opponents of nuclear power plants who argued they were not safe. Despite the good news about IFR and its inherent safety features, ANL was unable to gain sufficient support for the studies that would allow for scaling up of the concept. President Bill Clinton and the U.S. Congress, responding to calls for budget reductions, eliminated all funding for nuclear reactor research in 1994. In that year, EBR-II was shut down after thirty years of operation.[10]

The EBR-II reactor is in the process of dismantlement. Its fuel was removed and its liquid sodium coolant has been

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[9] Stacy, *Proving the Principle*, p. 234-237.

[10] "Argonne Proposes `Proliferation-resistant' breeder," *Physics Today* (August 1984), p. 62; Holl, p. 450-456; Brandon Loomis, "End of an Era at Argonne, EBR-II Reactor Ends 30-year Run," (Idaho Falls) *Post Register*, Sept. 29, 2994, p. 1.

drained from the reactor vessel. In 2000, ANL-W began treating EBR-II's sodium-bonded spent fuel. The electrometallurgical process is expected to have applications for the treatment of the Fermi reactor fuel currently in storage at INEEL. Elsewhere on the ANL-W site, soils contaminated with Cesium-137 have been subject to experimental phyto-remediation efforts, in which specific plants take up the cesium in their root systems.[11]

SubTheme: *Reactor Testing, Experimentation, and Development*
INEEL Area: Test Reactor Area

The TRA Retrenches: 1971-Present

The AEC's focus on the LMFBR affected operations at the TRA. The Engineering Test Reactor (ETR) was designated as a key test vehicle for the breeder's safety program. In the spring of 1973, the Aerojet Nuclear Corporation, the TRA operating contractor at the time, began developing special sodium-cooled test loops for the breeder project. This conversion of the ETR reactor required a new closure to the top of the reactor vessel, a special helium coolant system, and a sodium handling system. Once the reactor was properly equipped, Argonne National Laboratory (ANL) would begin testing in mid-1974. The object of the tests would be to verify safety characteristics of the fuel and core design of the Clinch River breeder reactor.[12]

However, Clinch River became a very uncertain project even before Congress refused in 1983 to fund it further. DOE shut down ETR in December 1981. It never ran again and was placed on inactive standby in January 1982.

When the Cold War ended in 1990, the Navy's demands on the ATR declined. National motivation to keep the frontier of nuclear knowledge moving ahead weakened.

The operation of test reactors at TRA had not ended, however. The ATR and its critical facility reactor continued to serve research needs originating both on and off the site. In 1985, for example, the critical facility tested electronic components needed for decontamination work around the site. For off-site customers, the ATR has been a source of neutrons for measuring thermal cross sections of geological samples in uranium and oil exploration.[13] The

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[11] From a November 24, 2003, review of website http://www.inel. gov/facilities/anl-w-status.shtml.
[12] *Thumbnail Sketch* 1973, p. 9
[13] *Site Development Plan*, Volume 2, TRA.

U.S. Navy continues as a major ATR customer. In 1996, the isotope production mission was commercialized. The ATR continues to produce isotopes used by medical, industrial, and agricultural customers.[14]

The DOE is actively seeking new customers and missions for the Test Reactor Area, not only from within the United States, but all over the world. In 1999, the ATR was equipped with a new test feature, the Irradiation Test Vehicle, which is capable of accommodating fifteen separate tests at a time, speeding up research results for customers. The improvements are marketed to universities, among other research customers.[15]

In the meantime, DOE is ordering the decontamination and dismantling of unused TRA buildings to reduce maintenance expenses, remediate contaminated sites, and reduce the potential for further environmental hazards from occurring.

SubTheme: *Cold War Weapons and Military Applications*
INEEL Area: Auxiliary Reactor Area (Army Reactor Area)

The ARA sites after 1971

After the Army effort to create very small nuclear power generators collapsed in 1965, the NRTS contractor changed the name of the area to Auxiliary Reactor Area. The name was an apt indicator of the new mission of ARA buildings and facilities -- to provide technical support for other programs at the NRTS.[16]

At ARA-I, some of the buildings were remodeled to support various study programs taking place elsewhere on the site. A Plant Applications and Engineering Tests program was set up to ascertain the reliability, capability, and durability of safety system performance. Related work included taking fatigue measurements on irradiated materials, studying ways to extend fuel life of the Advanced Test Reactor, and analyzing component failures.[17]

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[14] "ATR Celebrates 30 years of testing," *Lockheed Star* (July 1, 1997), p. 1.

[15] Raymond V. Furstenau and S. Blaine Glover, "The Advanced Test Reactor Irradiation Facilities and Capabilities," found on November 24, 2003, at http://www.anes2002.org/proceedingcd/58Fur.pdf.

[16] *Site Characteristic* Idaho Falls: Idaho Operations, 1990), p. 14 of "Sitewide."

[17] *Site Characteristics*, p. 14 of "INEL Sitewide." Also,

The welding shop at ARA-II closed in 1987, and the rest of the complex remained idle until it was declared excess and prepared for dismantlement. In 1996 the Department of Energy, Environmental Protection Agency, and the State of Idaho agreed to improve the safety of the SL-1 burial ground by recontouring the site to direct water away from it and constructing an impermeable cap over it.[18]

After the Army deactivated the Gas Cooled Reactor Experiment and ML-1 tests in 1965, its buildings were likewise adapted for other uses. After the reactor was removed, the pipes were closed off, and the reactor pit was covered with concrete blocks. From 1966-1986, technicians used the building as a component and instrument lab to test and evaluate items used in reactor experiments elsewhere on the site. Such business was declining, however, and by 1987 this area too went idle.[19]

ARA-IV, the erstwhile home of the ML-1 reactor, was home for a short time to a small reactor sent from the DOE's Nevada Test Site, the Nuclear Effects Reactor, known as FRAN. This small reactor could supply bursts of high-intensity fast neutrons and gamma radiation. Its first criticality at the NRTS was August 28, 1968. Its mission was to test new detection instruments developed for reactor controls. But the program phased out, and the AEC sent the reactor to Lawrence Livermore Laboratory in 1970.

ARA-IV was renamed the Reactives Storage and Treatment Area (RSTA) in 1987. The purpose of RSTA was to provide a remote, safe location to store potentially reactive and explosive waste before shipping it off the INEL site or treating it further on-site. The activities carried on at RSTA site included detonation, open burning, and the chemical reaction of reactive and explosive waste. The cost of maintaining required operating permits for RSTA was high, and the amount of reactive waste diminished. INEL decided to close the site. The waste and the containers were characterized and classified as non-reactive and non-hazardous, and moved to an excess-materials storage yard at the CFA.

"Auxiliary Reactor Area," *Nuclear News* (May 1969), p. 60.

[18] Erik Simpson, "Agencies agree to cap reactor burial grounds," *INEL News* (February 6, 1996), p. 7. A similar treatment was agreed to for the BORAX-1 burial ground.

[19] Julie Braun, *Draft Historic Resource Management Plan for Historic Architectural Properties on the INEL* (Idaho Falls: US DOE, 1994), p. 71.

Decontamination and dismantling of the ARA clusters began in 1988. The DOE, the Idaho SHPO, and the NPS signed a Memorandum of Agreement to preserve the photographic and engineering record of the Army programs and prepare a HAER report. All ARA buildings except a small control building at ARA-IV have been dismantled. Because the HAER study documented the Army program, ARA buildings were not included in the inventory accompanying this report.[20]

SubTheme: *Cold War Weapons and Military Applications*
INEEL Area: Naval Reactors Facility

<u>Maintaining the Status Quo: 1971-present</u>

The 1970s and the 1980s marked the maturing of the NRF. New initiatives were much reduced, and most developmental work consisted of placing new cores in the existing reactors. In 1973, a prototype core for a two-reactor carrier was installed in the A1W plant and brought to power. In October 1984 the S5G Prototype completed end-of-life testing, and a new core containing a reused module from the submarine USS *Narwhal* was installed. It achieved criticality in 1986. Meanwhile, in 1973, the S1W prototype exceeded its originally estimated twenty-year design lifetime, and was still operating successfully.

In the 1970s, the Nuclear Navy was focusing its efforts on the improvement of submarine performance. The Navy was competing with Soviet nuclear submarines that were feared to be faster and deeper-diving than the Navy's. Admiral Rickover and Navy contractors were dealing with accusations of corruption and bribery in relation to defense contracts. The entire defense industry, in particular General Dynamics, was under attack for overspending and fraud.[21]

Throughout the 1970s, the workload at the ECF increased substantially. Additional hot cells with a transfer tunnel to the storage pools were constructed. By 1977, the first off-site reactor control rods were received for examination and repair. In 1979, the S1W demonstrated the feasibility of reusing all radioactive water, and discontinued discharging any radioactive liquids into the environment. By 1980, the

[20] "Memorandum of Agreement Among the United States Department of Energy, Idaho Field Office, the Idaho State Historical Preservation Office, and the Advisory Council on Historic Preservation," August 13, 1993.

[21] These issues were the subject of Patrick Tyler, *Running Critical, The Silent War, Rickover, and General Dynamics* (New York: Harper and Row, 1986).

ECF was sending liquid wastes to the ICPP for evaporation.

In 1981, the ECF expanded again with a fourth storage pool, this one designed to examine the reactor core from the Shippingport Power Station.[22] The ECF also continued receiving irradiated materials from TRA. Since 1957, approximately 3600 transfers have been made between ECF and TRA in shipping casks transported by exclusive-use truck.

International events soon affected the course of the Navy's reactor programs. Tensions began easing between the United States and the Soviet Union even before President George Bush declared the end of the Cold War in November 1990. Nuclear disarmament treaties reduced the buildup of a nuclear arsenal on both sides. The Navy no longer needed to maintain the vast nuclear fleet of surface ships and submarines that had been the legacy of the USS *Nautilus*. And consequently, it no longer needed to run the S1W Prototype to train operators of nuclear ships. On Oct. 17, 1989, the S1W concluded its last power operation. The prototype had operated for 36 years, longest of any nuclear reactor in the world at the time. The A1W shut down in 1994; the S5G, in 1995.

The three prototypes are presently inactive. The Navy's spent nuclear fuel shipments continue to arrive at the ECF, but an agreement with the State of Idaho has established milestones for final storage at an off-site repository. The involvement of the State of Idaho in the conduct of DOE affairs in Idaho has been a relatively new influence on the INEEL, arising out of concerns about the water quality of the Snake River Plain Aquifer and the indefinite plans of DOE for permanent disposal of nuclear waste.[23]

Historic Significance of the NRF

Idaho's NRF played an important role in establishing the "Nuclear Navy," allowing the United States to attain early naval supremacy in opposition to the Soviet Union during the Cold War. Careful engineering, testing, and training under the rigorous procedures laid out by Admiral Hyman Rickover gave the NRF and the U.S. Navy an excellent reputation for nuclear safety.

Several world "firsts" occurred at the NRF. The S1W

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[22] *Naval Reactors Facility, 1994.*

[23] United States Department of Energy, *INEL Comprehensive Facility and Land Use Plan* (Idaho Falls, Idaho: DOE/ID-10514, March 1996), p. 21-23.

prototype of the USS *Nautilus*, the first "atomic machine" was constructed there. As Westinghouse executive John Simpson observed, "This was the Kittyhawk of the Atomic Age."[24] Navy executives, including Admiral Rickover and USS *Nautilus* Commander William Anderson, credited NRF workers and on-site training of naval personnel for the success of the Navy's nuclear propulsion program. The site's initial success with the S1W prototype inspired the Navy to invest in further prototype projects in Idaho. These included the world's first nuclear aircraft carrier prototype (A1W), and the S5G, the first natural-circulation reactor. Both prototypes proved successful and helped the United States maintain its naval strength. These "firsts," it should be noted, all occurred before 1970.

SubTheme: *Military (and other) Applications*
INEEL Area: Test Area North

Specific Manufacturing Capability (SMC)

Even before the LOFT experiments ended in 1986, the buildings at TAN were modified for new uses. In 1983 the U.S. Army became one of INEEL's customers when it initiated a secret project using depleted uranium to manufacture a special armor for its M1-A1 Abrams tank. The project, named Specific Manufacturing Capability (SMC), was classified, so secret that many employees in the plant did not know the purpose of the work they were doing.

The project made use of the expansive space inside the old ANP hangar building, TAN-629. Essentially, the main manufacturing building was erected inside the hangar, hidden from possible overhead spy satellites. The project remained classified until 1990 when the Army made public the purpose of the program.[25] Numerous other TAN buildings support the SMC. The activity is notable as one of the few "production" activities at the INEEL (in contrast to "research and development.")

The Deactivation of TAN Activities and Facilities

A complete history of TAN would include a long list of general research customers, partly because of the presence of the TAN Hot Shop, still in use by various research

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[24] John W. Simpson, *Nuclear Power from Undersea to Outer Space* (LaGrange Park, Ill.: American Nuclear Society), p. 53.

[25] Stacy, *Hangar HAER*, p. 63. See also Stacy, *Proving the Principle*, p. 228-229.

programs at the INEEL. The Hot Shop, in the group of buildings referred to as the Technical Support area of TAN, includes programs dealing with the Three Mile Island Unit 2 Core Offsite Examination Program, the Spent Fuel Program, and others.

The Spent Fuel Program concerns itself with the casks that transport spent fuel from one place to another. This research involves not just the casks, but the entire range of testing, security, manufacturing, and certifying transfer systems related to cask transport.

The damaged core from Three Mile Island was shipped to TAN between 1986 and 1990. TAN facilities received the wreckage, examined it, and prepared it for temporary storage. In a multi-year process that ended in 2001, the material was moved from TAN to a dry-storage facility at INTEC to await its next move to a national repository for spent fuel.

However, many TAN's facilities are no longer in use. The facilities at the ANP "Initial Engine Test Area" have been demolished. The buildings that were part of the LOFT program -- the Containment and Service Building, the Reactor Control and Equipment Building, and numerous auxiliary support buildings -- are shut down and facing deactivation. The buildings used in connection to the tank armor project will continue in use for the foreseeable future.

Part of the LOFT program included a Water Reactor Research Test Facility (WRRTF), a group of buildings that supported the tests occurring in the LOFT containment building. These buildings include the Thermal-Hydraulic Experimental Facility Assembly and Test Building (TAN-640, earlier known the Low Power Test (LPT) facility), its related Control Building (TAN-641), the Semiscale Control and Administrative Building (TAN-645), and the Semiscale Assembly and Test Building (TAN-646). The future of these buildings is uncertain.

Significance of TAN

The evolution of program uses at TAN exemplifies the flexible adaptation of DOE's nuclear research facilities from military uses to peaceful uses -- and back to military uses. After the failure and cancellation of the ANP program, the facilities were readily reincarnated for other research themes. Of all of them, the LOFT program and the contribution it made to reactor safety was perhaps the most important.

The LOFT reactor was the only reactor in the world that could repeatedly simulate different kinds of loss-of-coolant accidents that might occur in commercial power plants. The experiments conducted from 1978 to 1986 contributed to the safe operation of nuclear reactors all over the world. DOE, recognizing that the Nuclear Energy Agency (NEA) of the Organization for Economic Cooperation and Development (OECD) had considerable experience in sponsoring international research programs, invited NEA to establish such a program with LOFT. In addition to the experiments already carried out, the program investigated more severe transients in which fuel disruption and release of fission products would occur. These experiments began in October of 1983. The OECD member countries participating were Austria, Finland, West Germany, Italy, Japan, Spain, Sweden, Switzerland, the United Kingdom, and the United States. In exchange for financial and technical collaboration, the OECD received valuable data on eight accident simulations, including reactor recovery to safe conditions. The experience of working closely together on post-test analysis forged enduring links among analysts in the member countries.

SubTheme: *Chemical Reprocessing*
INEEL Area: Chemical Processing Plant

The 1970s and 1980s: The Second Generation of ICPP Buildings

The decade of the 1970s began what the ICPP managers called a "facelift" of the plant. Safety standards for nuclear workers had become more stringent, as had standards for environmental protection. Decontaminating the process cells became more and more difficult -- a consequence of the fact that the main process and waste calcining buildings had been adapted to operate with chemical solutions that they had not been designed initially to handle. Aside from that, equipment simply was aging.

Design engineers addressed the ICPP's shortcomings by replacing and improving one system after another. New buildings appeared all over the campus. A new Waste Disposal Building, to wash and filter low-level gases and liquid wastes before release to the environment, was one of the first. An Atmospheric Protection System (CPP-649), a central filtering center that collected air and off-gases to preclude accidental releases, appeared in 1976.[26] Monitoring stations went up to detect and impound any waste water that

[26] *Thumbnail Sketch* 1973, p. 17.

became accidentally contaminated. Electrical distribution was revamped in a systematic upgrade. And a coal-fired steam generator plant went on line in 1984 to supply plant heat for the entire ICPP complex. Changes in waste management practices ended the use of wells for the injection of low-level radioactive liquid waste. Such liquid went instead to evaporation ponds. These new practices led to new monitoring stations housing new instrumentation and new pumps.

More significantly, four major new buildings replaced and modernized the original plant. The first to be replaced was the old Waste Calcining Facility (CPP-633). The old plant ended its ninth and last campaign in March 1981 after a run of nearly two years that had been interrupted several times by failing equipment. A new calciner had been under development and design since before 1975. It opened for its first hot run in September 1982. The building (CPP-659) had many features similar to the old one, but could process 3,000 gallons of feed per day, had better protection for workers and the environment, and could handle waste streams from a wide range of standard and exotic fuels. The building was placed northeast of the old calciner building between part of the tank farm and the oldest bin sets.

Next, the Fluorinel Dissolution Process (CPP-666) replaced the head-end portion of the original fuel reprocessing complex at CPP-601. Designed by the Ralph M. Parsons Company, it reversed the "direct maintenance" philosophy upon which the earlier process plants were based. The Fluorinel plant was to be operated and maintained by remote and computerized control. Under construction for four years, it was completed in 1984. The huge building -- its roof covers 2 3/4 acres -- integrated fuel storage with the dissolution process, meaning that fuel could be transferred underwater directly from its storage place to the process area without the use of transport casks. (At the time, site managers expected CPP-603, the original fuel storage complex, to be discontinued in the 1990s.)

The Fuel Storage Facility (FAST) contained six pools containing three million gallons of water. The pools, connected by transfer channels, were arranged in a north-south row. Within the pools were 2600 fuel storage positions. A cask-handling pool and two isolation pools were at the north end. To the east of the pools was the processing area, which contained a shielded process cell, operating galleries, and a chemical makeup area. Features such as shielded process cells, viewing windows, below-grade locations for process cells followed principles established in the earlier building. One of the building's innovative features was a plan to use decay heat (from the fission products in stored fuel) to heat the plant and other ICPP buildings in the future.[27]

The new plant began receiving fuel in 1984. Dissolution began in the spring of 1985. At the time, DOE expected the plant to pay back the cost of its construction ($200 million) within five years based on then-current values of enriched uranium and Krypton-85 gas.[28]

The third major improvement was a new laboratory, also designed by Ralph M. Parsons. The Remote Analytical Laboratory (CPP-684) joined the new processing and calcining facilities in 1986. Containing a hot cell, the lab examines and evaluates samples of highly radioactive waste. The samples arrive at the lab via a pneumatic transfer system similar to those used at drive-up bank windows. Compressed air moves the samples through an overhead pipe system connecting the laboratory to the new calciner and new processing buildings. Inside the laboratory, a small cart motivated by a magnetic drive system beneath the hot cell floor moves the samples from one manipulator station to another.[29]

The final phase of the upgrade began in 1988 with the commencement of the Fuel Processing Restoration project, which would completely replace the old uranium extraction plant, CPP-601, the original 1951 process building. This building was expected to take six to seven years before it was ready to start up in 1996.[30]

In accordance with President Ronald Reagan's determination to continue producing nuclear weapons, the Department of Energy decided to locate a Special Isotope Separation (SIS) process at the ICPP in 1989. The process was to accumulate Plutonium for nuclear weapons using lasers to separate isotopes from a metal vapor. The anticipated project brought a new wave of work to the area, opening up a new cluster of buildings at the north end of the ICPP. The SIS was never built, but the buildings remain.[31]

One of the legacies of the long Fluorinel and FAST construction periods was a substantial collection of

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[27] Logan, p. 205; and Westinghouse, *FDP Facts (Fluorinel Dissolution Process)* pamphlet (Idaho Falls: WINCO, 1986); and INEL, *FAST Facility at ICPP* (Idaho Falls: DOE/INEL, circa 1983), no page numbers.

[28] *FDP Facts.*

[29] Westinghouse, *RAL Facts* (Idaho Falls: WINCO, 1986).

[30] "40th Anniversary Package," p. 13.

[31] "40th Anniversary Package," p. 14.

construction- and contractor-related buildings -- offices, craft shops, warehouses, quality assurance labs, and waste accumulation structures. Temporary trailers and guard houses appeared on the scene, hauled to a useful (or available) place and parked on skids or bolted to concrete pads. Construction activity has been somewhat constant at the site, so these buildings have been re-used by the INEL manager or subsequent contractors. In the summer of 1997, a general clearance was underway. Several trailers were sent to the Arco School District for use at Arco High School.

Retrofitting and Remediation

The fuel processing and waste calcining equipment at the ICPP shut down in October 1989. Among the many laws, orders, and agreements pertaining to environmental protection was the Resource Conservation and Recovery Act of 1976 (RCRA). RCRA set forth standards for cleanup of hazardous waste sites and regulated the transport of hazardous wastes to prevent further contamination of the environment. It was now time for the vast kingdom of underground piping at the ICPP to be upgraded and retrofitted. The new standards specified that pipes carrying hazardous chemicals must be surrounded by a secondary containment -- a pipe surrounding the pipe that would catch the hazard should the primary pipe leak or break. Site workers took inventory and began years of work digging up and relaying pipes all over the plant.[32]

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, also known as "Superfund") provides mechanisms for the Environmental Protection Agency (EPA) to force agencies such as the DOE to clean up sites where accidents or usage have contaminated the soil or water. The State of Idaho passed a Hazardous Waste Management Act in 1983 which incorporated procedures and standards for dealing with asbestos and radioactive hazards.

The State of Idaho and the EPA pressed their interests, and the DOE itself issued various orders regarding the clean up of hazardous waste sites. On December 9, 1991, those three parties signed a Federal Facility Agreement and Consent Order, setting forth mutual goals on a wide range of activities. Since then the ICPP (and other areas of the INEEL) have cleaned up asbestos, petroleum product, heavy

[32] Kevin Richert, "Chem Plant closures will be indefinite, officials say," *Post-Register* (October 23, 1989).

metal, radionuclide, and other waste sites.[33]

The ICPP operators have undertaken a systematic survey and characterization of their site, identifying contaminated soils, buildings, and structures. After analyzing alternative approaches to the cleanup of a site, they undertake decontamination and dismantlement activities. In addition, obsolete or surplussed properties are being eliminated in accordance with DOE orders to reduce annual maintenance expenses at DOE laboratories.

The Cold War Ends -- The ICPP Acquires a New Mission and a New Name

After President George Bush declared the end of the Cold War in 1990, the Secretary of Energy ordered DOE facilities to terminate the recovery of uranium from spent fuel. The big new building under construction at the ICPP came to a halt, unfinished and suddenly irrelevant. And the State of Idaho -- after years of resisting the transport of nuclear waste and nuclear fuel into the state -- demanded that DOE perform a site-wide Environmental Impact Statement. The state filed for an injunction against any further receipt or storage of spent nuclear fuel until such an EIS was completed.

The conflict was resolved on October 16, 1995, with an agreement between DOE, the State of Idaho, and the U.S. Navy as to the future of fuel storage and management of liquid wastes at the INEL.[34] The agreement handed the ICPP a big job. It set forth compliance dates for calcining all of the remaining 1.7 million gallons of high-level liquid waste in the stainless steel tanks. In pursuit of this target, the New Waste Calcining Facility began a campaign during the summer of 1997 to calcine 287,000 gallons of non-sodium bearing waste, an effort that was completed in February 1998. The next goal is to calcine sodium-bearing waste, with

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[33] "INEL completes first 5 years of cleanup," *DOE This Month* (December 1996), p. 8.

[34] "Settlement Agreement between the State of Idaho, the Department of Energy, and Department of the Navy, October 16, 1995, to resolve issues in the action of Public Service Company of Colorado v. Governor Phil Batt [of Idaho]," No. CV91-0035-S. EJL (D.Id.) and US v. Batt, No. CV-01-0054-S-IJL (D.Id.) Section C.1 of the agreement says, "DOE shall remove all spent fuel, including naval spent fuel and Three Mile Island spent fuel from Idaho by January 1, 2035. Spent fuel being maintained for purposes of testing shall be excepted from removal, subject to the limitations [expressed elsewhere in the Agreement.]"

an end date expected by the end of 2012. When that task has been accomplished, the waste calcining process will likewise be irrelevant.[35]

The fuel left in wet storage when the 1992 order shut down the process must be relocated to dry storage facilities by December 2000. Fuels in the basins of CPP-603 and in CPP-666 must move to dry storage by the end of the year 2023. This meant another modification at CPP-603 to expand its capacity for dry storage of fuels then at the ICPP and also for the Three Mile Island fuels then stored at TAN.

The INEEL expects to receive a maximum of 575 shipments of Navy fuel between 1995-2035.[36] By that time, the federal government is expected to have a permanent waste repository for the country's stockpile of spent nuclear fuel.

With the evolution of a fuel storage mission, which features dry storage rather than storage shielded by water in pools or tanks, ICPP research has focused on new storage technologies and procedures, not new concepts for reprocessing spent fuel. Its engineers work on new technologies for waste management, better ways to store spent fuel, better ways to decontaminate and dismantle, and ways to scale up waste processing technologies to production-sized operations.

In 1999 the Chem Plant changed its name to Idaho Nuclear Technology and Engineering Center (INTEC). The mission of INTEC continues to focus on the technologies of receiving and storing spent fuel or calcining the waste still remaining at the plant.

Significance of Context V, Multi-Program Research

Much INEEL research since 1970 has not been related to nuclear reactors. Nor has it taken place on INEEL's desert site. After the MTR shut down in 1970, scientists looked for other projects. They found one at Raft River, Idaho, where they established the Raft River Pilot Plant, an investigation into geothermal energy.[37]

Other alternative energy explorations soon followed. Site scientists sought and found customers interested in a variety of research projects, including industrial energy

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[35] "INEEL restarts calcining liquid high-level waste," *LMITCO Star* (July 1, 1997).
[36] Section D.1.b. of Settlement Agreement.
[37] Stacy, *Proving the Principle*, p. 212-216.

conservation, the production of alcohol fuel, solar energy, and batteries for electric vehicles, and energy from biomass. INEEL became the DOE's lead laboratory for hydropower programs and helped the city of Idaho Falls install a low-head bulb-turbine system in the Snake River.[38]

Looking for new customers, helping private industry take advantage of government research ("technology transfer"), and diversifying research beyond nuclear questions -- these were new directions for INEEL. Most of these activities no longer required an isolated "test station" in the desert, although the desert continued to offer a practical laboratory for waste remediation research.

In 2002 the DOE declared that INEEL and ANL were to be its "lead laboratories" for nuclear energy research and development. At the same time, it began planning to "accelerate" the cleanup of and remediation of wastes at INEEL. Heretofore, INEEL has been managed from DOE's federal center in Washington, D.C., by its Division of Environmental Management (EM).

To better organize for new research initiatives (which may include the construction of a new reactor), DOE has begun to identify buildings that will be placed under the management of its Division of Nuclear Energy, Science, and Technology (NE). As of the date of this report, the final disposition of INEEL buildings under the purview of EM or NE is in progress. Many EM buildings will undoubtedly be slated for dismantlement or demolition. Some will be re-used.[39]

Context V, "Multi-Program Research" is, in general, a period that requires the passage of time -- at least fifty years -- before historians will discern how the historic patterns at work at the INEEL ought to be further described and characterized. Likewise, that time must pass before they should assess whether the buildings erected during this period are significant enough to qualify for preservation or recognition for their contributions to the broad scope of American history.

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[38] Stacy, *Proving the Principle*, p. 216.
[39] For an articulation of the new NE-related mission, see *INEEL, Strategic Plan*, January 2003.

CONTEXT VI: REMEDIATION OF WASTE: 1970-present

INEEL Area: Radioactive Waste Management Complex (RWMC)

Early Disposal Practices: 1952-1959

Environmental monitoring began at the NRTS before any radioactive material was even produced. In 1949 a one-year study documented natural background radiation. The study provided a starting point from which any radioactivity increase could be recognized and measured in air, water, cow's milk, soil, and animal flesh. With the beginning of NRTS operations, so did air and personnel monitoring. Quarterly or semi-annual reports were distributed to the Idaho Department of Health and the members of the Idaho Congressional delegation. In 1952 the United States Geological Survey reported a further base of useful information about the Snake River Plain Aquifer. This report expressed concern about potential contamination of the aquifer, but considered it a remote possibility.[1]

Among the many issues facing the youthful nuclear industry -- safety, industrial security, and reliable performance -- scientists also knew that the disposal of hazardous nuclear waste eventually would become a serious concern. In the 1950s, however, hazardous waste was not a ranking priority of the AEC. Each of the AEC's nuclear facilities made its own decisions about how to handle nuclear waste.[2] The AEC expected that by the time a commercial nuclear power industry had come into existence, further research and new technologies would have solved waste disposal problems.[3]

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[1] B.C. Anderson et al, *A History of the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory* (Idaho Falls: U.S. DOE Idaho Operations Office, Report PR-W-79-038, 1979), p. 21, 35, 101, 102. Hereafter referred to as "Anderson, *History of the RWMC*." Authors cite the U.S.G.S. report secondarily from sources such as an article by John Horan and Herman J. Paas, Jr., "Environmental Surveillance a the National Reactor Testing Station," *Health Physics* 12: 1039-1045 Pergamon Press, 1966; and a letter from Bruce L. Schmalz to F.M. Empson, "Information on Burial Ground," August 30, 1961.

[2] Jack M. Holl, *Argonne National Laboratory, 1946-96* (Chicago: University of Illinois Press, 1997), p. 73.

[3] For discussions of the AEC's early priorities, see, for example, see Michele Gerber, *On the Home Front: The Cold War Legacy of the Hanford Nuclear Site* (Lincoln: University of

As the Cold War escalated, the number of nuclear power plants and testing facilities nationwide increased. With this expansion came the generation of tons of radioactive waste and the growing dilemma of how to manage it. The NRTS expanded dramatically between 1950 and 1955. Radioactive waste came in the form of solids, liquids, and gases. Initially, some low-level liquid wastes were disposed of on-site at each reactor area via injection wells or settling ponds. The test reactors and ICPP released radioactive gases into the air, although releases were monitored and coordinated with favorable weather patterns so as to meet acceptable air-dilution levels.

The on-site airborne releases were relatively small compared to releases from weapons tests at the Nevada Test Site. The NRTS air monitors and other monitoring stations in Southern Idaho detected high amounts of airborne waste from the Nevada tests. One such test generated readings in Idaho so high that technicians attributed them to equipment error.[4]

Agricultural use of the land surrounding the NRTS site continued to grow. The 1950s advent of sprinkler irrigation and subsequent deep-well drilling made the desert surrounding the Site more attractive to farmers than it had been before. In addition, electricity was cheap. This caused the NRTS landlords concern, for they needed land as a safety buffer between the reactor complexes and local land use. In 1955, Congress authorized $1 million to purchase 140,000 acres north and east of the site. During this time, the AEC also made the level of "acceptable risk" for airborne releases eight times less stringent than it had been originally, so the acreage had the effect of adding additional protection. The purchase also included more area for expansion of the original waste burial grounds, which

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Nebraska Press, 1992); John Horan, George Wehmann, and Bruce L. Schmalz, "Experience in Site Selection at the National Reactor Testing Station, USA" (Idaho Falls: AEC, Health and Safety Division, 1962), hereafter referred to as "Horan, Wehmann, and Schmalz;" and Gerard H. Clarfield and William M. Wiecek, *Nuclear America: Military and Civilian Nuclear Power in the United States, 1940-1980* (New York: Harper and Row, 1984).

[4] Phillips Petroleum Co. Atomic Energy Division, internal report. *Survey of Fall-out of Radioactive Material in South and South-East Idaho Following the Las Vegas, Nevada Tests of October and November, 1951* (Prepared by the Site Survey Section of the Health Physics Division, NRTS, USAEC. January , 1952).

grew to 88 acres by 1957.[5]

In the late 1940s and early 1950s, the AEC thought that standard processes for domestic sewage treatment promised cost-effective radioactive waste treatment. In those early years, nuclear engineers and building designers viewed such low-level waste (composed of all radioactive waste not classified as high-level waste, transuranic waste, spent nuclear fuel, or natural uranium and thorium byproducts) in the same light as conventional chemical, or even domestic waste, particularly in dry climates.[6] The Hanford nuclear site used several separate sewer systems, for example, to carry plutonium-process wastes into drainage ditches and settling ponds. Increased radioactivity levels in these ditches and ponds led to Hanford's 1952 decision to phase out these ponds and use shallow trenches and subsurface rock "cribs."[7]

In 1952, NRTS engineers constructed a new sewage plant at the CFA. They used a "combination unit," also serving the "Hot Laundry" facility, which handled contaminated protective clothing. Although the Hot Laundry facility had a separate sewer line, it entered the same septic tank as the other CFA effluent and then went to the drain field. This process had evidently been tested at Los Alamos in 1952 and was considered an effective way to handle low-level waste. Eventually the sludge lines and drain field became contaminated.[8]

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[5] Anderson, *A History of RWMC*, p. 8. See also Horan, Wehmann, and Schmalz, p. 17-18.

[6] For example, see A.D. Mackintosh, "Architectural Problems in Atomic Labs," *Architectural Forum* (January 1952), p. 159-164; A.L. Biladeau, "Radioactive Waste Removal in a Trickling Filter Sewage Plant" (Idaho Falls: Idaho Operations Office of AEC, 1953); H.R. Zietlin, E.D. Arnold, and J.W. Ullmann (of Chemical Technology Division, Oak Ridge National Laboratory), "Economics of Waste Disposal" in *Manual on Nuclear Reactor Facilities* (New York: McGraw-Hill and *Nucleonics* Magazine, 1957), p. 101-103; and *INEL Comprehensive Facility and Land Use Plan* (Idaho Falls: DOE/ID-10514, 1996), p. 177.

[7] *National Register of Historic Places Multiple Property Documentation Form--Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington* (Richland, Washington: USDOE, February, 1997), Section 5, page 59. See also Gerber, *On the Home Front*.

[8] Idaho Operations Office, Engineering and Construction Division report by A. L. Biladeau, "Radioactive Waste Removal in A

Following the practice at other nuclear laboratories, the NRTS set aside a "Waste Burial Ground" for the disposal of contaminated wastes. The thirteen-acre site, isolated from the reactor facilities, was recommended by the U.S. Geological Survey. It had good surface drainage and clay sediments that would resist saturation.[9] On July 28, 1952, the first burial trench was opened, and low-level waste was placed in it. This waste consisted mainly of contaminated paper, laboratory glassware, filters, and metal pipe fittings. According to one 1953 internal report, liquid waste in sealed containers was also placed in the trench.[10] Between 1952 and 1957, nine more trenches were excavated to basalt bedrock. The trenches were enclosed with a barbed wire fence; metal tags marked the general location of the trenches. Low-level, site-generated waste was picked up twice a week, placed in sealed cardboard boxes, and randomly dumped into the trenches. Earth was placed over the boxes at the end of each week.[11] High-level waste also was dumped into trenches during this time. The material was contained in wooden boxes or 30-gallon garbage cans, shielded by a cask and lead open-top box container. These were immediately covered with earth.

Wastes from another AEC facility began arriving at the Burial Ground in March 1954. The Rocky Flats Fuel Fabricating Facility in Golden, Colorado, which manufactured trigger devices made of plutonium for nuclear warheads. The facility at Golden was small in size (four square miles), had a high water table, and was near a densely populated area. After studying the merits and economics of alternative sites, the AEC decided to ship the waste to the NRTS. Plutonium is a "transuranic" waste (TRU), an alpha-emitting

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Trickling Filter Sewage Plant," May 1953; and EG&G Idaho report by R. D. Browning, "TAN, TRA, and CFA Sewage Treatment Plant Study" (Operational and Capital Projects Engineering, January 1989).

9 Anderson, *History of the RWMC*, p. 11, 21. See notes No. 1 and No. 19. Also see "History, Radioactive Waste Management Complex," *INEL Technical Site Information*, 1993.

10 Anderson, *History of the RWMC*, p. 4, citing a report by P.T. Voegeli and Morris Deutsch, *Geology, Water Supply, and Waste Disposal at Sites 11 and 11A, Burial Ground D, and Vicinity* (Idaho Falls: NRTS ID)-22027, 1953).

11 Anderson, *History of the RWMC*. [np] See also "History, Radioactive Waste Management Complex," *INEL Technical Site Information*, 1993.

element with a half-life greater than twenty years whose combined activity level is at least 100 nanocuries per gram of waste.[12] TRU waste can remain radioactive for hundreds of thousands of years. Rocky Flats shipped metal drums of TRU waste by rail to Idaho, where it was interspersed with NRTS waste in Trenches 1 through 10.[13]

In using shallow land burial methods, the NRTS followed practices used by most other AEC facilities. It was the main disposal method throughout the 1950s. Other methods included underground injection, sea burial, and large pit disposal.[14] In 1957 *Nucleonics* magazine published a series of articles on the economics of efficient waste disposal. One of them said, "One of the potentially attractive schemes for the ultimate disposal of radioactive waste is simply to pour the waste into pits." The pits should not be located near processing plants for geological reasons, and some transport might be required. The authors of the report considered the possible benefits of processing nuclear waste, writing, "It may be necessary or desirable to remove some fission products from the waste, particularly the long-lived activities, prior to ground disposal." AEC scientists and engineers predicted that by the year 2000 accumulated waste would be $3x10^{11}$ curies, with an estimated "permissible" disposal cost of anywhere from $.60 to $64 per gallon.[15]

Rocky Flats waste dramatically increased in 1957 due to a severe fire at the plant. Large quantities of bulky and contaminated fire debris was shipped to the NRTS. To accommodate this substantial new volume, the NRTS created a series of "pits" for disposal of this waste. Pit 1 opened on November 1, 1957. That year the AEC also produced formal disposal procedures for the NRTS. Solid waste was packaged in steel drums or large crates, stacked near the pits, and

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[12] U.S. Department of Energy, *Linking Legacies: Connecting the Cold War Nuclear Weapons Production Processes to Their Environmental Consequences* (Washington, D.C.: Office of Environmental Management, January 1997), p. 40. Hereafter referred to as "*Linking Legacies*."

[13] Anderson, *History of the RWMC*, p. 16-21.

[14] *Linking Legacies*, p. 48.

[15] H.R. Zietlin, E.D. Arnold and J.W. Ullmann [Chemical Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tenn.], "Economics of Waste Disposal, *Manual on Nuclear Reactor Facilities* (New York: McGraw-Hill); and *Nucleonics* (1957), p. 101, 103-104.

then lowered into the pits by crane. Reporting and record-keeping on solid waste disposal was improved. The AEC further expanded and refined these requirements in 1959.[16]

Occasional flooding created problems at the Waste Burial Ground (later called the "Subsurface Disposal Area"). When the U.S. Geological Survey recommended the burial ground site in 1952, it had not predicted heavy cyclic floods. When the Big Lost River overflowed in 1958, site managers quickly arranged for a dam to divert water away from the burial ground. In 1962, two inches of rain fell on frozen ground, causing localized flooding. Some open trenches filled with water, allowing low-level waste barrels and boxes to float. A few boxes broke open, their contents of contaminated gloves and bottles to settle on lands near the burial grounds. These were retrieved and reburied. Diversion ditches and diking were constructed around the site, but intermittent flooding continued over the years.[17]

Interim Burial Ground: 1960-1963

As the number of AEC-licensed nuclear power plants increased, so did their waste. Utility companies hired from among several firms that packaged solid waste and buried it at sea. The cheaper cost of land burial caused the AEC to re-evaluate sea burial. In January 1960, the AEC announced plans to create regional interim burial grounds for commercial wastes. Until these were established, interim sites for storing wastes would be needed. In May, the AEC chose the Oak Ridge National Laboratory in Tennessee and Idaho's NRTS as the interim sites.[18] Two AEC-Idaho scientists, B.L. Schmalz and W.P. Gammill, wrote to the AEC stressing that the use of the NRTS as a burial ground be only a temporary measure. They indicated that a potential risk of water table contamination did exist and that the burial ground would soon be full. They recommended that the AEC investigate sites not overlying an aquifer. Combined with concerns about the Interim Burial Ground program, officials on and off the site questioned the wisdom of long-term storage of TRU waste at the NRTS.[19]

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[16] Anderson, *History of the RWMC*, p. 22-27. Anderson refers to the manual as an "AEC-ID Manual Chapter 0500-7."

[17] Anderson, *History of the RWMC,* p. 33.

[18] "West Coast Firm Attacks AEC Waste-Disposal Policy," *Nucleonics* (July 1960), p. 30; and "Luedecke Reaffirms AEC's Land Burial Waste Policy," *Nucleonics* (August 1960), p. 31.

[19] Horan, Wehmann, Schmalz, p. 17-18; see also Anderson's

As the AEC turned its attention to the issue, it required that Oak Ridge and the NRTS coordinate consistent procedures for land burial. No liquid waste was permitted, and fissionable material was closely supervised. Two major improvements in environmental monitoring were also implemented: increased subsurface monitoring by a system of ten monitoring holes around portions of the burial ground; and film badges placed around the perimeter to monitor direct radiation levels.

A special burial arrangement was made at a site outside of the official burial ground. An accident occurred at SL-1 in the Army Reactor Area (ARA) in January 1961, killing three men and damaging the reactor and much of the equipment in the reactor room. After a safety analysis indicated that it would be more hazardous to transport the debris to the burial ground than dispose of it closer to the site of the accident, a separate burial ground was opened about a quarter of a mile from the reactor. Some SL-1 materials were taken later to the interim burial ground and placed in Pit 1, which was reopened specifically for that purpose.[20]

The AEC closed the Oak Ridge and Idaho interim burial grounds in 1963, after commercial sites opened for business. Idaho continued to receive TRU waste from Rocky Flats because of its classified nature. That year also saw a step backwards from what later managers regarded as safe burial practices. A labor strike at the NRTS had created a limited work force. During the strike, workers dumped Rocky Flats waste randomly into the pits rather than stacking barrels in an upright and orderly way. This practice continued for seven years, long after the strike was settled, because site managers believed it minimized personnel radiation exposures. Rocky Flats waste sent to the NRTS after 1967 was dumped into Pits 9 and 10.[21]

Notes Nos. 1, 2, and 22.

[20] Anderson, *History of the RWMC,* p. 31-33.

[21] Anderson connects the 1963 labor strike with a change in practice from stacking to random dumping of waste containers from evidence in letters, memos, and personal communications. These are cited on p. 31 of his report; see Note Nos. 10, 27, and 28. See also an internal report from Frank G. Schwartz and Paul V. Strider, "Management of Pit 9--Highlights of Accomplishments and Lessons Learned to Date" (Idaho Falls, Idaho: U.S. DOE Idaho, 1997), p. 1; and "A Comprehensive Inventory of Radiological and Nonradiological Contaminants in Waste Buried in the Subsurface Disposal Area of the INEL RWMC During the Years 1952-1984" (Idaho

Increasing Environmental Concern, 1964-1970

Although environmental concerns at the Burial Ground already existed, these concerns were exacerbated by national and local events during the mid- and late-1960s. In the 1950s, the popular media had focused on fears of fallout and the "monsters" that might be engendered from radioactivity, not the practical problems of accumulating waste with radioactive half-lives. The national consciousness concerning environmental degradation on all fronts was raised by chemists, biologists, and other writers. Nevil Shute's grim 1957 novel *On the Beach* and Rachel Carson's *Silent Spring*, published in the 1960s, aroused public concerns about nuclear fallout and chemicals hazardous to the environment.

In 1960 and 1965, a National Academy of Sciences committee visited the NRTS and its waste burial ground. The committee felt that the ultimate leakage of plutonium waste was inevitable because the steel drums containing it would eventually corrode. Other minor incidents raised further concerns. In September 1966, two fires occurred in the waste burial ground, caused by alkali metal wastes inadvertently included with low-level waste. Further fires were prevented by compacting and immediately covering the barrels with earth. Another flood occurred in 1969, inundating the entire burial ground. Pits 9 and 10 were flooded, along with two trenches.[22]

Despite these problems, Pits 9 and 10 continued to receive mixed waste (low-level waste containing hazardous waste or PCBs) from Rocky Flats. In 1969, a 12,000-gallon metal tank filled with mixed waste from the Air Force was also placed in Pit 10.[23]

Falls, Idaho: EG&G Idaho, Inc., October 1993), p. 1-2 to 1-4.

[22] Anderson, discusses the report, but does not name it, citing a reference by John Horan in Note 32; see p. 35-39, 104. See also documents related to the report in the files of Idaho Governor Don Samuelson at Idaho State Historical Society, Box 50, File "Nuclear--1970." The *New York Times* reported that the AEC released a copy of the report to the *New York Times* in 1970. See clipping in file by Bob Smith, "AEC Scored on Storing Waste," March 7, 1970, no page number.

[23] Anderson, *History of the RWMC*, p. 38-41. See also D.H. Card, "History of Buried Transuranic Waste at INEL" (Idaho Falls, Idaho: EG&G Idaho, Inc., 1977), p. 23-31. Hereafter referred to as

By 1968, national concerns over water pollution resulted in the issuance of President Lyndon Johnson's Executive Order 11288, entitled "Prevention, Control and Abatement of Water Pollution by Federal Activities." The Federal Water Quality Administration surveyed the NRTS burial ground that year to determine if additional controls were needed to carry out this policy. Idaho Senator Frank Church also became concerned about Rocky Flats waste stored over the aquifer. He requested four federal agencies -- the U.S.G.S., Bureau of Radiological Health and U.S. Public Health Service, the Federal Water Pollution Control Administration, and the Bureau of Sport Fisheries and Wildlife -- to review the burial ground.[24]

In 1969, water samples taken from a subsurface monitoring hole after that spring's flood indicated that small amounts of Cesium-137 were present. The NRTS Health Services Laboratory conducted further investigations in 1969 and 1970 and found that some fission products and plutonium isotopes had leached into surrounding soil, probably because of the flood.[25] Although it was believed that these small amounts could not reach the aquifer, the finding stimulated operational changes. In December 1969, John Horan, Director of the Health and Safety Division of the Idaho Operations Office at the NRTS, wrote to the AEC recommending that burial of Rocky Flats waste be suspended during the winter months, and that plutonium-contaminated waste be segregated.[26]

Early Environmental Remediation and Cleanup: 1970-1979

In 1969 Congress passed the National Environmental Policy Act. In 1970 the AEC issued "Immediate Action Directive No. 011-21," regarding solid waste burial. This directive ordered segregation of high-level waste and storage to permit retrieval of contamination-free waste containers after periods of up to twenty years.[27]

"Card."

[24] Anderson, *History of the RWMC*, p. 35-36.

[25] Anderson, *History of the RWMC*, p. 41-42.

[26] Anderson, *History of the RWMC*, p. 37-38.

[27] Re the politics behind the federal environmental acts, see Mary Beth Norton, et. al., Vol. 2, *A People and a Nation* (Boston: Houghton Mifflin Company, 1986). See also Anderson, *History of the*

The NRTS gradually changed the way it stored different kinds of waste. Rocky Flats waste was carefully packed in drums and stacked once more, with Pit 11 reserved for this use. Waste contained in cardboard boxes was stored in Pit 10. Approximately 90 boxes were also placed in Pit 11, but they were stacked at the other end of the pit. Pit 11 was closed in October of 1970. That same year, TRU waste was still placed in Pit 12. The TRU waste consisted of sludge drums from Rocky Flats. The Idaho Operations Office decided not to bury any more Rocky Flats TRU waste in 1970 and began stacking it above ground. It expanded the waste management area to include 144 acres and closed Pit 12 closed in November.[28]

Until 1970, no buildings had been erected at the Waste Burial Ground and no waste had been stored above ground. In 1970, NRTS built a permanent above-ground facility, then called the Interim Transuranic Storage Area (now TSA). It consisted of a sloping asphalt pad 400 feet long, with a foot-high soil berm surrounding three sides. As the pad filled, individual cells were built and surrounded by firewall. The stacked waste was covered first with plywood, a nylon-reinforced polyvinyl, with soil two to three feet deep placed on top.[29]

To carry out the 1970 AEC decision to move TRU waste to above-ground storage, several studies on the waste's condition and cost of removal had to be performed first.[30] The studies, conducted in 1971, revealed varied conditions. Some drums were in good condition, while others were corroded and leaking. Buried plywood boxes and cardboard cartons were almost completely deteriorated. The NRTS assigned permanent equipment and personnel to the waste management site for the first time.

The Clean Water Act of 1972 stimulated further changes at the NRTS. A training program for operators and supervisors at the Waste Burial Ground was initiated in 1973, as was the first formal environmental surveillance plan.

RWMC, p. 42.

[28] Card, p. 31-33.

[29] Anderson, *History of the RWMC*, p. 44.

[30] Anderson, *History of the RWMC*, p. 42; see his Note No. 34, p. 104.

In March 1974, the AEC generated is own program, the "Formerly Utilized Sites Remedial Action Program." The NRTS (renamed Idaho National Engineering Laboratory (INEL) in August 1974) commenced drum retrieval operations, but only of those which were unbreached. Wooden and cardboard boxes were not retrieved because of their advanced state of deterioration. A total of 20,262 drums were repackaged and stored during the program.[31]

From 1975 to 1977, major changes in national oversight and regulation of the nuclear industry occurred. The AEC was abolished in 1974 upon objections that the agency was both regulator and regulated. The AEC's research and weapons production missions were given to the Energy Research and Development Administration (ERDA); its regulatory authority, to the Nuclear Regulatory Commission (NRC).[32]

In 1976, a new federal law was enacted to regulate hazardous waste disposal -- The Resource Conservation and Recovery Act (RCRA). At the INEL, further studies were conducted on uncontained TRU waste. Workers used an air support weather shield to retrieve the waste from Pit 2. Drums and boxes were badly deteriorated, but waste had not migrated into the surrounding soil.[33]

During the 1970s the first buildings were constructed at the Waste Burial Site, which was renamed the Radioactive Waste Management Complex (RWMC). The Radiation Analysis Laboratory (later called the RADCON field office, WMC-601), a metal building on a concrete slab, was placed at the site. A prefabricated metal building served as the Decontamination Facility (now called the RWMC High Bay, WMC-602). Of similar construction were the Pump House (WMF-603), and the Supervisor's Office (WMF-604, now called the Change House and Lunch Room Facility). These buildings later were termed the Administrative Area of RWMC. Permanent buildings were not built because the waste burial site was intended to be relatively temporary. Temporary buildings also were easier to dispose of if they became contaminated. Meanwhile, at a national level, ERDA requested funding in 1975 to evaluate and possibly develop a site in southeastern New Mexico for

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[31] Anderson, *History of the RWMC*, p. 55.

[32] Terence R. Fehner and Jack M. Holl, *Department of Energy, 1977-1994, A Summary History* (Washington, D.C.: U.S. Department of Energy History Division, DOE/HR-0098, 1994), p. 6, 17-20.

[33] Anderson, *History of the RWMC*, p. 59.

the permanent storage of TRU waste.[34]

In 1977 the Department of Energy (DOE) replaced ERDA as the cabinet-level federal agency in charge of the nuclear industry. Locally, changes were made in the way waste was stored at the INEL. Instead of trenches and pits, soil vaults were now used in what was now termed the Subsurface Disposal Area (SDA). Two cells in the Transuranic Storage Area (adjacent to the SDA) were then tested in 1978. This storage proved to be acceptable, especially after an air support weather shield was permanently placed over it.[35] In 1978, carbon steel vaults were placed in the Intermediate Level Transuranic Storage Facility (ILTSF). In later years, these proved to be corrosive. Further construction occurred at the RWMC in 1979. As part of continuing efforts to monitor waste, observation well houses (WMF 606-608) were built around the site. A heavy equipment storage shed (WMF-609) was constructed, again out of steel and metal, to house cranes and other large machines.[36]

The Era of CERCLA and Superfund: 1980-1989

In 1980, Congress passed the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), which established a "Superfund" to clean up the chemical waste sites that would be placed on a National Priority List for such cleanup. Some of the cleanup involved moving waste from one site to another. That same year, the Argonne National Laboratory (East) started sending its low-level waste to the INEL's RWMC site.

The Superfund effort lagged in 1981 under the Reagan Administration. Virtually no Congressional authorizations effected any change at the INEEL during the early 1980s. Only a guardhouse (WMF-611) was constructed at RWMC.[37]

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[34] R.D. Logan and D. Jacobson, Internal Technical Report, "INEL Building Study, Perimeter Area Buildings" (Idaho Falls, Idaho: EG&G Idaho, Inc., December 1990). Some construction dates in this report conflict slightly with 1993 and 1996 INEL Technical Site Information reports.

[35] Anderson, *History of the RWMC*, p. 54-59.

[36] Logan and Jacobson, (1990).

[37] "A Comprehensive Inventory, 1952-184" (October 1993), p. 1-4; "INEL Building Study" (1990).

In 1982 Congress passed the Nuclear Waste Policy Act. This law provided for the development of geologic repositories for high-level waste and spent nuclear fuel disposal. The act also established research, development, and demonstration programs regarding disposal of these particular wastes. On the heels of this act came the April 1983 *Leaf v. Hodel* decision, which subjected DOE to the 1976 RCRA requirements for handling hazardous waste disposal. Also during this time, the DOE had chosen Carlsbad, New Mexico, for a Waste Isolation Pilot Plant (WIPP) as its permanent TRU waste repository. After protracted controversy, WIPP opened, and the INEEL began shipping qualified waste for permanent storage in 1999.

The need to qualify waste suited for WIPP storage led to plans for two waste disposal projects at the INEL. In 1984 the Stored Waste Examination Pilot Plant (SWEPP) opened. It provided operations capabilities for nondestructive examination and certification of TRU waste stored at the INEL. The RWMC's SWEPP facility was the first of its kind in the United States. Once the waste was certified at SWEPP, it was ready to be shipped to the New Mexico WIPP site. Waste which did not meet WIPP's waste acceptance criteria would be shipped to the proposed Process Experimental Pilot Plant (PREPP) for processing. PREPP, to be located at TAN, was planned as an experimental program to devise methods of processing wastes into acceptable forms. The proposed program would involve the shredding and incinerating of waste, then immobilizing it in concrete.[38]

SWEPP started operating in 1985. The SWEPP program generated another "first" for the INEL -- it was the first United States facility to perform nondestructive examination and certification of defense-generated TRU waste. However, the PREPP facility was never started, partly because of questions about the program's capabilities. DOE eventually decided to prepare transuranic wastes for shipment to a then-undecided national waste burial site elsewhere than at INEL. The emphasis at INEL shifted to preparation and packaging of the material for shipment. In 1988 and 1989, the TRUPACT II (transuranic waste package containers) loading station, work control trailers, and communications building were constructed at RWMC.

INEEL Area: SPERT/Power Burst Facility

[38] Video Script, "Processing Experimental Pilot Plant (PREPP)" (Idaho Falls, Idaho: EG&G Idaho, 1984).

New Mission for the Power Burst Facility (PBF)

In the 1980s SPERT/PBF took on a new research mission directed to waste management. In 1968 SPERT-III had been put in standby condition. In 1980 it was decontaminated, and its system components recovered. The process pit, reactor pit, dry storage houses, reactor head dock, main reactor floor, and the storage canal all were decontaminated. In 1982 it was renamed the Waste Experimental Reduction Facility (WERF) and converted to include an incinerator, melting furnace, compactor, and sizing shop where metallic waste was cut up and re-sized. WERF's mission was to reduce the volume of low-level radioactive waste and mixed waste before it was shipped to a disposal site.[39]

In 1985 the SPERT-I reactor, which had been located in a below-grade pit, was dismantled and the area returned to it's original state. In 1986 the SPERT-II Facility was renamed the Waste Engineering Development Facility (WEDF). It served as a place for investigating radioactive and mixed waste treatment technologies and processes. SPERT-IV also entered the waste management arena in 1986. It was renamed the Mixed Waste Storage Facility (MWSF) and modified to provide interim storage space for low-level mixed waste until the waste was dispatched to a more permanent waste site.[40]

The INEL's Post-Cold War Mission: 1990-1997

On December 9, 1991, the DOE Idaho Operations Office, Region 10 of the Environmental Protection Agency, and the Idaho Department of Health and Welfare signed the INEL Federal Facility Agreement and Consent Order. This document supplied all parties with a goal to restore the environment at the INEL and guidelines for a variety of cleanup activities. The sites to be cleaned up included those contaminated with asbestos, petroleum products, acids and bases, radionuclides, unexploded ordnance and explosive residues, PCBs, heavy metals and other hazardous wastes. It was hoped that INEL could be removed from the National Priorities List by 2006.

This legally binding document has provided numerous benchmarks and milestones in the remediation of hazardous

[39] *Comprehensive Facility and Land use Plan.* (Idaho Falls: Idaho National Engineering Laboratory, March 1996), p.157.

[40] *Comprehensive Facility and Land use Plan,* p.157.

residues of many kinds. Each facility complex in the desert was given a new label as a "Waste Area Group" or WAG. The resulting ten WAGs were then further inventoried as to their "Operable Units," or individual targets for clean up. WAG 10 covered the desert land beyond the fences of the Site's nine complexes. Under that name, the Navy's unexploded ordnance, chunks of TNT, and other debris were targeted for cleanup. Other projects involve the removal and treatment of organic vapors beneath the Radioactive Waste Management Complex, the excavation and treatment of buried mixed transuranic waste from Pit 9 and the treatment of contaminated groundwater from beneath TAN.[41]

The laboratory building to which many of the scientists who worked on waste cleanup reported was located in Idaho Falls. The Idaho Research Center (IRC), created in the 1980s during the national interest in fuel efficiency, expanded as INEL research efforts moved in directions such as fuel alcohol, the biological processing of ores, development of special metal alloys, and welding. For these types of work the INEL hired its first microbiologists and biochemists. When the INEL later faced its many complex cleanup challenges, the appropriate personnel and laboratory facilities were available. The desert, former site of explosives tests, nuclear experiments, industrial and nuclear waste disposals of many kinds, and myriad forms of contamination large and small, became the new laboratory for IRC scientists charged to remediate it all.[42]

The federal support of cleanup grew. During the 1990s, about sixty percent of the total INEL budget was for "Environmental Management," or cleanup. John Wilcynski, DOE manager during between 1994-1999, used to simplify INEL's path forward with the slogan, "Finish the sixty, and grow the forty," meaning that as the cleanup tasks were accomplished, the research mission of the laboratory could resume a larger share of the total effort.[43]

In 2003, DOE and its regulatory partners, the State of Idaho and the Environmental Protection Agency, were considering a cleanup schedule that would "accelerate" many of the target dates and deadlines to which they had previously agreed. This administrative thrust has the potential to accelerate the rate at which buildings and

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41 *INEL Reporter* (November/December 1996), p. 1.

42 Stacy, *Proving the Principle*, p. 247-249.

43 Stacy, *Proving the Principle*, p. 253.

facilities -- many of them of historic significance -- are being decommissioned and dismantled. Even whole building clusters, which made up such a significant part of INEEL's historic "landscape," are proposed for complete erasure. The Army Reactors Area already has been eliminated in this fashion (although this was done prior to the "accelerated" schedule).

Significance of the Remediation of Waste Context

Though the history of the RWMC is relatively brief, the facility highlights a major turning point for the INEEL and the national nuclear industry. The early optimism engendered by nuclear energy's peaceful potential gradually became clouded by controversy about the disposition of waste and spent reactor fuel. In the 1970s the issues of burial, cleanup, and remediation of nuclear waste came to the national forefront. After the Cold War ended in 1990, interest (and funding) for nuclear science rapidly waned. The development of the RWMC and its constantly evolving technologies reflect this important shift in the history of INEEL and the national atomic energy program.

The INEL provided early experimental prototypes for nuclear waste remediation. The 1984 the Stored Waste Examination Pilot Plant (SWEPP) began operation at the INEL, the first United States facility of its kind to provide capabilities for nondestructive examination and certification of TRU waste. Whether this prototype will prove to have lasting historical significance or, indeed, whether the Remediation of Waste context itself, will survive the fifty-year benchmark for the National Register shall have to await the passage of time.

NOTES ON THE SITE SURVEY AND INVENTORY OF BUILDINGS

Purpose of Survey

The building survey and inventory provides a data base to support INEEL management plans and programmatic agreements. Its users will include INEEL Cultural Resources Department personnel, site property managers and planners, and the Idaho State Historic Preservation Office (SHPO). In addition to descriptive data, the forms supply information about a building's typology and its relationship to a historic context (if any). In some cases, the forms also recommend that the preservation of certain historically significant buildings be an element of future historic preservation management plans.

Previous Surveys

The staff of the INEEL Cultural Resource Department initiated surveys of the Central Facilities Area and the Test Reactor Area in 1995 and 1996 respectively. Using SHPO reconnaissance forms current at that time, the staff recorded buildings constructed before 1975 and photographed each building, taking two oblique views that showed four sides of the building.[1]

The Arrowrock Group, Inc., surveyed the rest of the buildings at the INEEL in 1997, except those at the Naval Reactors Facility (NRF) and Argonne West, and reformatted the earlier data onto the newly developed forms. The contractor for DOE/Pittsburgh Naval Reactors contracted separately with Arrowrock to complete an inventory of NRF buildings which was completed in 1998. The survey included black/white photographs. Argonne-West staff surveyed Argonne-West buildings in 1998, photographing the buildings using a digital format.[2]

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[1] Julie Braun, *LITCO Internal Report, Idaho National Laboratory Historic Building Inventory Survey, Phase I* (Idaho Falls: LITCO Report No. INEL-95-0498, 1995; and Julie Braun and Clayton Marler, *Idaho National Engineering Laboratory Historic Building Inventory Survey, Phase II* (Idaho Falls: Lockheed Martin Report No. INEL-96/0374).

[2] Hollie Gilbert, Fabulous Argonne Survey as yet with no title known to SS,

Photographs: Special Circumstances

The Idaho SHPO agreed in 1997 that the 1995 and 1996 photographs of the Central Facilities and Test Reactor areas were acceptably recent for the Arrowrock extension of the survey. Arrowrock continued the protocol of taking two oblique photographic views. Large or complex buildings required more than two views. For most buildings in the survey, this report represents each building with only one view. The remaining views are on file at the INEEL photograph laboratory in Idaho Falls.

Numerous "memoranda of agreement" have been negotiated between the Department of Energy and the Idaho SHPO since 1993 regarding mitigation for historic buildings that were to be altered or demolished. Pursuant to those, photographs were required and taken of the buildings in question and of one entire site activity complex, the Army Reactor Area (ARA). The ARA was documented in HAER-ID-32-D, completed in 2001. Only one extant building from ARA-IV has been inventoried.

During this survey, access to Howe Peak was not available. Howe Peak is a high-elevation site containing several communications facilities. It is located outside the boundary of the INEEL site, and access is restricted for security reasons. In spring and early summer 1997, the road was still covered with snow. Photographing Howe Peak buildings would have required leasing either a helicopter or four-wheel drive vehicle and securing appropriate clearance and escort. We suggest that inventory forms and photographs be supplied to SHPO as time allows to complete the inventory or if any of the buildings at Howe Peak are scheduled to be altered or dismantled.

Since the 1997 survey period, new buildings have been erected at the site. In no case are these buildings classifiable as "historic" or of "exceptional" historic interest. They have been inventoried and are now part of this updated report. Photographs of each are available in the *INEEL Comprehensive Facility and Landuse Plan*, which is routinely amended and updated.[3]

Exempt Buildings.

[3] United States Department of Energy, *INEEL Comprehensive Facility and Land Use Plan*. Idaho Falls: DOE/ID Report No. 10514, March 1996. The INEEL intranet address for this document is http://mceris.inel.gov.

Upon mutual agreement between INEEL and the Idaho SHPO, utility structures and mobile trailers have been exempted from survey and inventory. Therefore, such buildings are not included in this inventory.[4]

Content of the Inventory Forms

Property Data. This section includes the property name and the INEEL building number. The alphabetic prefix refers to a site complex: CFA for example, indicates Central Facilities Area. The numbers were assigned in sequence based on age. The first number was 601. When 600 numbers were exhausted at a given site, the next building was numbered 1601. Occasionally, numbers were re-issued to new buildings after an earlier building bearing that number had been dismantled. "Structures" are given 700 and 1700 numbers, except at Argonne-West, where buildings are assigned 700 numbers.

Historic Context. The general context for all INEEL properties, taken from the list of contexts in *National Register Bulletin 16 A*, is Science/Engineering. This phrase is followed by one of the three (sub)contexts discussed in this report: Nuclear Reactor Testing, Multi-Program Research, or Remediation of Waste.

National Register Recommendations. Historical research, summaries of which are presented in Part 1 of this report and supplemented by *Proving the Principle, A History of the Idaho National Engineering and Environmental Laboratory 1949-1999*, informed the historic assessment of buildings. An early hypothesis was that buildings were likely to be either uniquely related to a significant activity (such as a heat exchange system designed for a specific nuclear reactor and its coolant) or supportive of it, but not uniquely so (office building). Historic significance was expected, in most cases, to reside in the buildings containing a reactor experiment or main chemical process and its immediate auxiliaries.

This hypothesis was under constant review as the team visited each of the facility areas, walked the grounds with the INEEL photographer, and consulted technical and documentary sources. The hypothesis proved a good one, but

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[4] See Julie Braun, *INEEL Historic Architectural Properties Management Plan for U.S. Department of Energy, Idaho Operations Office* (Idaho Falls: Bechtel BWXT Idaho, LLC, Report No. INEEL/EXT-02-1338, Revision O), p. 18, 95-96.

additional insight materialized. Although the facility areas are distinct, they have complex programmatic and physical interconnections such as roads, electric utilities, and communications. We observed the obvious impact that new missions and new conditions are having on each facility area.

Yet the site resembles its older historic self. Change is occurring well within the "cluster" arrangements established between 1949 and 1970. Except for some environmental monitoring and remediation activities, most activities are still confined within rectangular perimeter fences, secured by guard gates, and served with interior streets and pathways. Each area contains the usual mix of built objects: industrial buildings, structures, and the occasional artifact. Activities just outside the fences also take the same forms they always did: sewage lagoons, evaporation ponds, and laydown yards. At various locations elsewhere on the wide expanse of the desert, environmental research and monitoring stations dot the scene; their purpose has changed since the 1950s, but their presence creates a similar appearance. Observing these continuities strengthened our conviction that the most useful way to regard this site is as a historic landscape that continues its evolutionary process.

For this reason, the historians assessed every building in the survey as part of a "historic landscape," regardless of its construction date. The INEEL is a landscape that "historically has been used by people, or shaped or modified by human activity, occupancy, or intervention, and that possess a significant concentration, linkage, or continuity of areas of land use, vegetation, buildings and structures, roads and waterways, and natural features."[5] The continuity in this landscape is remarkable.

After considering the history of the site, we found that the "Ordnance Testing/World War II" and "Nuclear Reactor Testing" context are historically or "exceptionally" significant on both a national and state level. These contexts extend from 1942 through 1970. The protocol for acknowledging this on the inventory forms was to indicate that buildings of this period are "contributing in a potential district." If the building was one of the reactor or process buildings that was significant, it was additionally noted as "individually eligible." If an

[5] Linda Flint McClelland, et al, *National Register Bulletin 30, Guidelines for Evaluating and Documenting Rural Historic Landscapes* (Washington, D.C.: U.S. Department of the Interior, National Park Service, no date.), p. 1-2.

auxiliary building was associated with a reactor, it was identified as "contributing in a potential district."

Buildings erected in 1971 or later are noted as "not eligible" and/or "not contributing," with the exception of buildings that we consider of "exceptional significance."

It is expected that this information will support historic preservation plans aiming to preserve archival documentation, develop HABS/HAER-level recordation, and carry out other recommendations discussed in the introduction to this report.

Style, Plan, Materials, and Square Footage of Building. Most INEEL buildings are enclosures with no intentional style. The word "None" or "No style" indicates this. The "Plan" entry describes the shape of the building, approximate height, and roof style. This, when considered together with square footage can supply a rough image of the structure. The majority of INEEL buildings are rectangular, metal-clad, and metal-roofed.

Condition. Assessments of condition are taken from the *INEEL Comprehensive Facility and Land Use Plan* published by the INEEL in 1996 and as this document has been amended and updated.

Future Plans. This data represents the intentions of INEEL planners as stated in the 1996 Land Use Plan referenced just above, taking into account its subsequent updates.

Original Use, Current Use, and Historian's Type Classification. The typology provides a link between a specific building and the historic context. (See below for Typologies.) For example, a "pumphouse" constructed during the years of the "Nuclear Reactor Testing" context may be typed as a "Utility" if it is related to a water supply well. If it is related to the management of radioactive liquid waste, it will be typed "Waste Management." Both types are "contributing" features, but the utility pumphouse may be of substantially less historic interest.

Property Types

INEEL buildings fall into one of four context periods discussed in Part 1 of this report. For each context, one would expect to find certain types of properties. The continuity between "Nuclear Reactor Testing" and "Multi-Program Research" is such that the same typology holds for each. The Chemical Processing Plant (INTEC) does not contain nuclear reactors; however, its main processing buildings are of equivalent significance.

Some judgement must be exercised in assigning a building to a certain classification. Some overlap in the use of the terminology is natural. For example, some "storage" buildings may be directly associated with the operation of a reactor, as in the storage of plugs; other storage may be related to the warehousing of construction materials.

Property Types for Context III: Ordnance Testing

Testing facilities: Gun pit, concussion wall, bunker, target
Research: Laboratory
General administration: Office
Personnel services: Barracks, bunkhouse, residence, garage, cafeteria, dispensary
Auxiliary support: Fire suppression, storage/warehouse, maintenance/shops
Utilities: Water, heat, electricity, sewer
Transportation: Gantry crane, railroad tracks, roads
Communication
Security: Guard house, guard gates, fence, training range

Property Types for Contexts IV and V: Reactor Testing, Experimentation, and Development; and Multi-Program Research

Reactor/Test Experiment: Reactor building, reactor prototype, critical facility reactor
Reactor/Test Support: Laboratory; control room; coolant processing and handling; hot cell; fuel transfer; waste handling, storage, and processing; administration; shop fabrication, maintenance, repair; personnel services
Production: manufacturing facilities
General administration: Office
Personnel services: Cafeteria, dispensary, library, sleeping quarters
Auxiliary support: Training, health physics and safety labs, fire, suppression, emergency evacuation, badging
Utilities: Water, heating, electricity, sewer
Waste management and environmental monitoring: Monitoring stations, evaporation ponds, pumps, injection wells, instrument housing, meteorological stations, animal pens and barns
Transportation: Railroads, roads, bus depot, bus maintenance garage, bike paths/racks, helicopter

pads, scale house
Communication: Microwave relay, towers
Security: Guard houses, gates, fences, training ranges

Property Types for Chemical Processing Plant

Main Process Building: Chemical separation, calcining
Main Process Support: Fuel chopping, laboratory, hot shop, offices
Other types are similar to those in "Nuclear Reactor Testing."

Property Types for Context VI: Remediation of Waste

Waste Processing Facilities: Processing vaults and tunnels, pump houses, loading stations, hot cells, examination and certification stations, SWEPP, Pit 9 structure, pumphouses, storage
Decontamination Facilities: Hot laundry
Waste Venting facilities: Chlorine venting, propane vaporizer housing, SWEPP drum venting facility
Waste Monitoring Stations: Well houses, meteorological stations, field laboratory, soil percolation test stations, soil test grouting facility, core storage library, waste water laboratory
General administration: Offices
Personnel services: Change house, lunchroom
Auxiliary support: Warehouse, shop fabrication, maintenance, repair, equipment storage
Utilities: Water, heating, electricity, sewer
Security: Guard house, gates, fences
Transportation: Railroad stations, loading stations, shipping and receiving stations, helicopter facilities
Communication: Trailers, towers

Sources of Information

The following reports were particularly useful in providing data about construction dates, construction materials, and alterations. In cases where reports gave conflicting data, we used the data judged to be most reliable or consulted other sources. (To avoid duplication and undue lengthening of each form, these citations do not appear on each inventory form.)

Energy Management Surveys. After the Arab Oil Embargo of the United States in 1973, the Department of Energy mandated all of its facilities to reduce their level of energy usage by 25 percent within a specific number of years. At the INEEL this order resulted in the application of insulated siding on many cinder block buildings, construction of vestibules, weatherstripping, and the like.[6]

DOE issued a second order in 1985 to reduce energy usage an additional 10 percent by 1995. The Energy Management department researched, photographed, and inventoried each site building; prepared an energy audit; and made further recommendations. This information was published in the following reports.

T.L. Kinnaman, N.A. Rhodehouse, and D.M. Teel. *INEL Building Study, Test Reactor Area*. Idaho Falls: EG&G Report No. F&M-PM-88-015, 1988.

T.L. Kinnaman. *INEL Building Study, Test Area North*. Idaho Falls: EG&G Report No. F&M-PM-87-013, 1987.

R.D. Logan. *INEL Building Study, Idaho Chemical Processing Plant*. Idaho Falls: EG&G Report No. F&MD-PM-90-017, 1990.

R.D. Logan and C.E. Jacobson. *INEL Building Study, Perimeter Area Buildings*. Idaho Falls: EG&G, 1990.

D.M. Teel and T.L. Kinnaman. *INEL Building Study, Central Facilities Area*. Idaho Falls: EG&G, 1986.

Site Development Plans. DOE Order 4320.1B requires the preparation of Five Year Plan documents. These provided useful lists of buildings, site maps, and other information about the projected use or excessing of a building. We consulted a series of updates to these, beginning with versions originating in 1981.

Site Characteristics, Volume II, Site Development Plan. Idaho Falls: DOE ID, 1983 and later updates.

L.D. Smith, C.E. Jacobson, J.R. Cunningham. *Idaho National Engineering Laboratory Site Technical Information*. Idaho Falls: U.S. DOE Idaho Operations Office Report No. DOE/ID-10401, 1993.

Idaho National Engineering Laboratory. *Comprehensive Facility and Land Use Plan*. Idaho Falls: Report

[6] Dave Teel, Energy Management, in interview with Susan Stacy at Engineering Research Office Building, May 20, 1997.

No. DOE/ID-10514, 1996. The INEEL intranet address for this document is http://mceris.inel.gov.

Technical Reports. Technical reports available for some buildings describe construction design criteria. These typically explain the logic behind certain features of a building and provide insight as to its purpose.

IDAHO HISTORIC SITES INVENTORY: **INEEL HISTORICAL CONTEXT**
Idaho State Historic Preservation Office

This form documents a building at Idaho National Engineering and Environmental Laboratory. It assesses its eligibility for the National Register of Historic Places and includes other data pursuant to a Programmatic Agreement for INEEL.

PROPERTY DATA

*Property Name/Area/Bldg. Number ____ / ____ / ____
*USGS Map Reference ____
*Township ____ Range ____ Section ____, ____ 1/4 of ____ 1/4 of NE 1/4, Boise Meridian
UTM: zone ____ ____ easting ____ northing
*County Butte Acres ____ City 40 miles west of Idaho Falls *Address Idaho National Engineering and Environmental Laboratory
Historic Context Science/Engineering: ____
*Property Type: Building *Total # features ____
*Associated bldgs./structures ____
*Construction Date ____ Estimated Construction Period ____
Style ____ Plan ____
*Condition ____ *Moved: Yes ____ When ____
*Materials ____

*Original Use Govt./ ____ *Current Use Govt./ ____

NATIONAL REGISTER RECOMMENDATION: (check all that apply)

____ Individually eligible
____ Contributing in a potential district
____ Multiple property study
____ Significant person
____ Architectural/artistic values

____ Not eligible
____ Noncontributing
____ Historical significance
____ Historic landscape
____ Not evaluated

Comment ____
*Recorded by The Arrowrock Group, Inc. *Phone (208) 344-7371
*Address 1718 North 17th Street, Boise, Idaho 83702
*Project/Report Title Historic Context of INEEL, Toward a Programmatic Agreement
Survey Report # ____ Reconnaissance X Intensive ____ *Date Sept. 19, 1997

FIELD NOTES/ADDITIONAL INEEL INFORMATION

Other name(s) ____
Access restrictions due to contamination ____ yes
Square footage of building ____
Future plans ____
Historian's type classification ____

Additional comment page attached ____ yes

Other notes:

INVENTORY OF SURVEYED BUILDINGS, INEEL CONTEXT STUDY, 2003

Power Burst Facility Area

Building	Eligible for NR	Year blt	Context
PER 601	Yes	1955	NRT
PER 604	Yes	1955	NRT
PER 606	Yes	1956	NRT
PER 609	Yes	1957	NRT
PER 612	Yes	1959	NRT
PER 613	Yes	1960	NRT
PER 616	Yes	1967	NRT
PER 617	Yes	1962	NRT
PER 619	Yes	1955	NRT
PER 620	Yes	1966	NRT
PER 622	No	1990	Multi-Prog
PER 623	No	1991	Multi-Prog
PER 624	No	1974	Multi-Prog
PER 625	Yes	1966	NRT
PER 626	No	1972	Multi-Prog
PER 627	Yes	1966	NRT
PER 629	No	1981	Multi-Prog
PER 632	No	1980	Multi-Prog
PER 634	No	1983	Multi-Prog
PER 635	No	1981	Multi-Prog
PER 638	No	1995	Multi-Prog
PER 641	No	1993	Multi-Prog

Total Number of buildings: 22

Distribution by decade:

1950s6
1960s6
1970s2

Distribution by context:

NRT 12
Multi-Prog 10

1980s4
1990s4
2000s0

Central Facilities Area

Building	Eligible for NR	Year blt	Context
CFA 601	Yes	1950	NRT
CFA 602	Yes	1969	NRT
CFA 603*	No	1943	Ord WW2
CFA 604	No	1983	Multi-Prog
CFA 606	Yes	1942	Ord WW2
CFA 607	Yes	1942	Ord WW2
CFA 608	No	1984	Multi-Prog
CFA 609	No	1988	Multi-Prog
CFA 611	No	1991	Multi-Prog
CFA 612	No	1983	Multi-Prog
CFA 613	Yes	1943	Ord WW2
CFA 614	No	1986	Multi-Prog
CFA 615	No	1991	Multi-Prog
CFA 616	No	1983	Multi-Prog
CFA 617	No	1981	Waste
CFA 619	No	1989	Multi-Prog
CFA 621	No	1983	Multi-Prog
CFA 622	No	1984	Multi-Prog
CFA 623	No	1986	Multi-Prog
CFA 624	No	1986	Multi-Prog
CFA 625 A&B	No	1989	Waste
CFA 629	No	1979	Multi-Prog
CFA 632	Yes	1945	Ord WW2
CFA 633	Yes	1943	Ord WW2
CFA 635	Yes	1943	Ord WW2

Building	Eligible for NR	Year blt	Context
CFA 637	Yes	1943	Ord WW2
CFA 638	Yes	1943	Ord WW2
CFA 642	Yes	1943-49	Ord WW2
CFA 643	No	1977	Multi-Prog
CFA 646	Yes	1950	NRT
CFA 650	Yes	1943	Ord WW2
CFA 651	Yes	1943	Ord WW2
CFA 652	No	1979	Multi-Prog
CFA 660	Yes	1963	NRT
CFA 661	Yes	1963	NRT
CFA 662	Yes	1952	NRT
CFA 663	No	1990	Waste
CFA 664	Yes	1951	NRT
CFA 666	Yes	1951	NRT
CFA 667	Yes	1951	NRT
CFA 668	Yes	1951	NRT
CFA 671	Yes	1951	NRT
CFA 674	Yes	1952	NRT
CFA 676	Yes	1963	NRT
CFA 677	Yes	1951	NRT
CFA 678	Yes	1951	NRT
CFA 680	Yes	1951	NRT
CFA 684	Yes	1952	NRT
CFA 685	Yes	1952	NRT
CFA 686	No	1979	Multi-Prog
CFA 688	Yes	1963	NRT
CFA 689	Yes	1963	NRT
CFA 690	Yes	1963	NRT
CFA 692	Yes	1950	NRT

Building	Eligible for NR	Year blt	Context
CFA 693	Yes	1969	NRT
CFA 695	Yes	1966	NRT
CFA 696	No	1995	Multi-Prog
CFA 697	Yes	1960	NRT
CFA 698	Yes	1969	NRT
CFA 699	Yes	1969	NRT
CFA 1601	No	1995	Waste
CFA 1602	No	1990	Multi-Prog
CFA 1603	No	1995	Multi-Prog
CFA 1605	No	1995/96	Waste
CFA 1606	No	1995	Multi-Prog
CFA 1607	No	1995	Multi-Prog
CFA 1608	No	1995	Multi-Prog
CFA 1609	No	1995	Multi-Prog
CFA 1610	No	1995	Multi-Prog
CFA 1611	No	1996	Multi-Prog
CFA 1612	No	1996/97	Multi-Prog
CFA 1614	No	1997	Multi-Prog
CFA 1616	No	1997	Multi-Prog
CFA 1618	No	2000	Multi-Prog

* CFA 603 was altered after 1970 and is no longer eligible.

Total number of buildings: 74 (CFA-625 counted as one bldg.)

Distribution by decade:

1940s12
1950s15
1960s12
1970s 4
1980s13
1990s17
2000s 1

Distribution by Context:

Ord WW2 12
NRT 27
Multi-Prog 30
Waste 5

Sitewide Facilities

Building	Eligible for NR	Year blt	Context
B8-601	No	1984	Multi-Prog
B8-602	No	1986	Multi-Prog
B16-602	Yes	1958	NRT
B16-603	Yes	1964	NRT
B16-605	Yes	1956	NRT
B16-606	Yes	1963	NRT
B16-607	No	1982	Multi-Prog
B16-610	Yes	1960	NRT
B21-606	No	1984	Multi-Prog
B21-607	No	1988	Multi-Prog
B21-608	No	1989	Not identified
B21-609	No	1989	Not identified
B21-610	No	1989	Not identified
B21-611	No	1989	Not identified
B21-612	No	1994	Not identified
B21-620	No	1995	Not identified
B25-601	No	1995	Not identified
B27-601	No	1984	Multi-Prog
B27-602	No	1984	Multi-Prog
B27-603	No	1986	Multi-Prog
B27-604	No	1985	Multi-Prog
B27-605	No	1987	Multi-Prog
B27-606	No	2002	Not identified

Number of buildings: 23

Distribution by decade:

1950s 2
1960s 3
1970s 0
1980s14

Distribution by Context:

NRT 5
Multi-Prog 10
Not identified 8

1990s 3
2000s 1

Army Reactor Area

Building	Eligible for NR	Year blt	Context
ARA 617	Yes	1962	NRT

Number of buildings: 1

Experimental Breeder Reactor-1 Area

Building	Eligible for NR	Year blt	Context
EBR-601 *	Yes	1950	NRT
EBR-602	Yes	1950	NRT

Number of buildings: 2

* EBR-1 is a National Historic Landmark. It is managed in accordance with the requirements of the National Historic Landmarks program found at 36 CFR Part 65.

Test Reactor Area

Building	Eligible for NR	Year blt	Context
TRA 603 MTR	Yes	1952	NRT
TRA 604	Yes	1952	NRT
TRA 605	Yes	1952	NRT
TRA 607	Yes	1952	NRT
TRA 608	Yes	1952	NRT
TRA 609	Yes	1952	NRT
TRA 610	Yes	1952	NRT
TRA 611	Yes	1952	NRT
TRA 613	Yes	1952	NRT
TRA 614	Yes	1952	NRT
TRA 616	Yes	1952	NRT

Building	Eligible for NR	Year blt	Context
TRA 618	Yes	1952	NRT
TRA 620	Yes	1952	NRT
TRA 621	No	1982	Multi-Prog
TRA 622	Yes	1952	NRT
TRA 624	No	1981	Multi-Prog
TRA 625	No	1981	Multi-Prog
TRA 626	Yes	1952	NRT
TRA 628	No	1986	Multi-Prog
TRA 629	Yes	1956	NRT
TRA 630*	No	1952	NRT
TRA 632	Yes	1953	NRT
TRA 632A	Yes	1956	NRT
TRA 634	No	1982	Multi-Prog
TRA 635	Yes	1952	NRT
TRA 636	Yes	1952	NRT
TRA 637	No	1979	Multi-Prog
TRA 638	No	1979	Multi-Prog
TRA 640	No	1984	Multi-Prog
TRA 641	Yes	1955	NRT
TRA 642 ETR	Yes	1957	NRT
TRA 643	Yes	1957	NRT
TRA 644	Yes	1957	NRT
TRA 647	Yes	1957	NRT
TRA 648	Yes	1957	NRT
TRA 649	Yes	1966	NRT
TRA 651	Yes	1960	NRT
TRA 652	Yes	1966	NRT
TRA 653	Yes	1957	NRT
TRA 654	Yes	1959	NRT

Building	Eligible for NR	Year blt	Context
TRA 655	Yes	1957	NRT
TRA 656	Yes	1959	NRT
TRA 657	Yes	1952	NRT
TRA 658	No	1987	Multi-Prog
TRA 660 ARMF	Yes	1957	NRT
TRA 661	Yes	1962	NRT
TRA 662	Yes	1961	NRT
TRA 663	Yes	1957	NRT
TRA 664	Yes	1961	NRT
TRA 665	Yes	1962	NRT
TRA 666	Yes	1963	NRT
TRA 667	Yes	1964	NRT
TRA 668	Yes	1956	NRT
TRA 669	Yes	1968	NRT
TRA 670 ATR	Yes	1964	NRT
TRA 671	Yes	1971	NRT
TRA 673	Yes	1971	NRT
TRA 674	No	1984	Multi-Prog
TRA 675	No	1987	Multi-Prog
TRA 676	No	1989	Multi-Prog
TRA 677	No	1992	Multi-Prog
TRA 678	No	1991	Multi-Prog
TRA 679	No	1991	Multi-Prog
TRA 680	No	1991	Multi-Prog
TRA 681-686	No	1985	Multi-Prog
TRA 687	No	1995	Multi-Prog
TRA 688	No	2000	Multi-Prog
TRA 689	No	1997	Multi-Prog
TRA 690	No	1997	Multi-Prog

Building	Eligible for NR	Year blt	Context
TRA 691	No	1996	Multi-Prog
TRA 692	No	1996	Multi-Prog

Number of buildings: 71 + 5 = 76

Distribution by decades:

1950s43
1960s13
1970s 5
1980s12
1990s13

Distribution by context:

NRT 59
Multi-Prog 27

* TRA 630 has been substantially altered and no longer retains its historic feature.

Note: Building TRA 615 was built in 1970 and indicated for the NRT context. TRA 671 and 673 were built in 1971, but were assessed as part of the Nuclear Reactor Testing Context because of their close association with the Advanced Test Reactor.

Test Area North

Building	Eligible for NR	Year blt	Context
TAN 601	Yes	1956	NRT
TAN 603	Yes	1956	NRT
TAN 604	Yes	1956	NRT
TAN 605	Yes	1956	NRT
TAN 606	Yes	1956	NRT
TAN 607	Yes	1955	NRT
TAN 609	Yes	1956	NRT
TAN 616	Yes	1955	NRT
TAN 618	No	1987	Multi-Prog
TAN 624	Yes	1959	NRT
TAN 628	Yes	1958	NRT
TAN 629*	Yes	1958	NRT

Building	Eligible for NR	Year blt	Context
TAN 630	Yes	1959	NRT
TAN 631	Yes	1959	NRT
TAN 633	Yes	1958	NRT
TAN 636	Yes	1967	NRT
TAN 637	Yes	1958	NRT
TAN 640	Yes	1958	NRT
TAN 641	Yes	1958	NRT
TAN 642	Yes	1957	NRT
TAN 645	Yes	1960	NRT
TAN 646	Yes	1965	NRT
TAN 647	Yes	1965	NRT
TAN 648	Yes	1961	NRT
TAN 650	Yes	1960	NRT
TAN 651	Yes	1960 asm	NRT
TAN 653	No	1985	Multi-Prog
TAN 654	No	1986	Multi-Prog
TAN 655	No	1972	Multi-Prog
TAN 657	No	1971	Multi-Prog
TAN 658	Yes	1960s	NRT
TAN 662	No	1978	Multi-Prog
TAN 664	Yes	1954	NRT
TAN 665	No	1980	Multi-Prog
TAN 666	No	1980	Multi-Prog
TAN 667	No	1983	Multi-Prog
TAN 668	No	1985	Multi-Prog
TAN 671	No	1975	Multi-Prog
TAN 672	No	1979	Multi-Prog
TAN 675	No	1984	Multi-Prog
TAN 676	No	1985	Multi-Prog

Building	Eligible for NR	Year blt	Context
TAN 677	No	1974	Multi-Prog
TAN 678	No	1985	Multi-Prog
TAN 679	No	1986	Multi-Prog
TAN 680	No	1985	Multi-Prog
TAN 681	No	1985	Multi-Prog
TAN 682	No	1986	Multi-Prog
TAN 686	No	1987	Multi-Prog
TAN 687	No	1989	Multi-Prog
TAN 688	No	1986	Multi-Prog
TAN 690	No	1976	Multi-Prog
TAN 692	No	1988	Multi-Prog
TAN 693	No	1988	Multi-Prog
TAN 694	No	1987	Multi-Prog
TAN 695	No	1992	Multi-Prog
TAN 1601	No	1995	No context assigned
TAN 1611	No	2000	No context assigned
TAN 1613	No	2002	No context assigned

Number of buildings: 58

Distribution by decade:

1950s19
1960s 8
1970s 7
1980s20
1990s 2
2000s 2

Distribution by Context:

NRT	27
Multi-Prog	28
None assigned	3

* TAN Hangar 629 was the subject of HAER No. ID-33-A.

Chemical Processing Plant

Building	Eligible for NR	Year blt	Context
CPP 601	Yes	1953	NRT
CPP 602	Yes	1953	NRT
CPP 603	Yes	1952	NRT
CPP 604	Yes	1951	NRT
CPP 606	Yes	1950	NRT
CPP 608	Yes	1950	NRT
CPP 609	No	1982	Multi-Prog
CPP 615	No	1980	Multi-Prog
CPP 616	Yes	1953	NRT
CPP 617	Yes	1950s	NRT
CPP 618	No	1975	Multi-Prog
CPP 619	Yes	1955	NRT
CPP 620	Yes	1968	NRT
CPP 620 A	No	1989	Multi-Prog
CPP 622	No	1974	Multi-Prog
CPP 623	No	1974	Multi-Prog
CPP 626	No	1977	Multi-Prog
CPP 627	Yes	1955	NRT
CPP 628	Yes	1953	NRT
CPP 629	No	1985	Multi-Prog
CPP 630	Yes	1956	NRT
CPP 632	No	1974	Multi-Prog
CPP 634	Yes	1958	NRT
CPP 635	Yes	1957	NRT
CPP 636	Yes	1965	NRT
CPP 637	Yes	1958	NRT
CPP 638	Yes	1968	NRT
CPP 639	Yes	1958	NRT

Building	Eligible for NR	Year blt	Context
CPP 640	Yes	1961	NRT
CPP 644	No	1982	Multi-Prog
CPP 645	No	1977	Multi-Prog
CPP 646	Yes	1965	NRT
CPP 647	No	1970	Multi-Prog
CPP 648	No	1972	Multi-Prog
CPP 649	No	1976	Multi-Prog
CPP 651	Reassess	1974	Multi-Prog
CPP 652	No	1975	Multi-Prog
CPP 653	No	1975	Multi-Prog
CPP 654	No	1977	Multi-Prog
CPP 655	No	1974	Multi-Prog
CPP 656	No	1980	Multi-Prog
CPP 658	No	1975	Multi-Prog
CPP 659 NWCF	Reassess	1978	Multi-Prog
CPP 660	No	1978	Multi-Prog
CPP 661	No	1988	Multi-Prog
CPP 662	No	1976	Multi-Prog
CPP 663	No	1983	Multi-Prog
CPP 664	No	1974	Multi-Prog
CPP 665	No	1980	Multi-Prog
CPP 666 Flor	Reassess	1978	Multi-Prog
CPP 668	No	1984	Multi-Prog
CPP 671	No	1981	Multi-Prog
CPP 672	No	1981	Multi-Prog
CPP 673	No	1986	Multi-Prog
CPP 674	No	1984	Multi-Prog
CPP 675	No	1984	Multi-Prog
CPP 677	No	1984	Multi-Prog

Building	Eligible for NR	Year blt	Context
CPP 679	No	1983	Multi-Prog
CPP 682	No	1982	Multi-Prog
CPP 684 RAL	Reassess	1985	Multi-Prog
CPP 685	No	1981	Multi-Prog
CPP 687	No	1983	Multi-Prog
CPP 688	No	1983	Multi-Prog
CPP 689	No	1983	Multi-Prog
CPP 690	No	1983	Multi-Prog
CPP 691	Reassess	1993	Multi-Prog
CPP 692	No	1983	Multi-Prog
CPP 693	No	1980	Multi-Prog
CPP 694	No	1982	Multi-Prog
CPP 695	No	1984	Multi-Prog
CPP 696	No	1984	Multi-Prog
CPP 697	No	1986	Multi-Prog
CPP 698	No	1984	Multi-Prog
CPP 699	No	1985	Multi-Prog
CPP 1604	No	1986	Multi-Prog
CPP 1605	No	1986	Multi-Prog
CPP 1606	No	1986	Multi-Prog
CPP 1607	No	1985	Multi-Prog
CPP 1608	No	1987	Multi-Prog
CPP 1610	No	1985	Multi-Prog
CPP 1611	No	1985	Multi-Prog
CPP 1612	No	1985	Multi-Prog
CPP 1615	No	1990	Multi-Prog
CPP 1616	No	1986	Multi-Prog
CPP 1617	No	1986	Multi-Prog
CPP 1618	No	1990	Multi-Prog

Building	Eligible for NR	Year blt	Context
CPP 1619	No	1989	Multi-Prog
CPP 1630	No	1987	Multi-Prog
CPP 1631	No	1989	Multi-Prog
CPP 1634	No	1995	Multi-Prog
CPP 1635	No	1992	Multi-Prog
CPP 1636	No	1989	Multi-Prog
CPP 1637	No	1989	Multi-Prog
CPP 1638	No	1989	Multi-Prog
CPP 1642	No	1992	Multi-Prog
CPP 1643	No	1992	Multi-Prog
CPP 1644	No	1991	Multi-Prog
CPP 1646	No	1992	Multi-Prog
CPP 1647	No	1993	Multi-Prog
CPP 1649	No	1991	Multi-Prog
CPP 1650	No	1991	Multi-Prog
CPP 1651	No	1994	Multi-Prog
CPP 1653	No	1991	Multi-Prog
CPP 1656	No	1991	Multi-Prog
CPP 1659	No	1994	Multi-Prog
CPP 1662	No	1993	Multi-Prog
CPP 1663	No	1993	Multi-Prog
CPP 1666	No	1994	Multi-Prog
CPP 1671	No	1994	Multi-Prog
CPP 1672	No	1993	Multi-Prog
CPP 1673	No	1994	Multi-Prog
CPP 1674	No	1993	Multi-Prog
CPP 1676	No	1994	Multi-Prog
CPP 1677	No	1993	Multi-Prog
CPP 1678	No	1993	Multi-Prog

Building	Eligible for NR	Year blt	Context
CPP 1681	No	1994	Multi-Prog
CPP 1682	No	1994	Multi-Prog
CPP 1683	No	1996+	Multi-Prog
CPP 1684	No	2000	Multi-Prog
CPP 1686	No	2000	Multi-Prog
CPP 1689	No	2003	Multi-Prog
CPP T-1	Yes	1965	NRT
CPP T-2	No	1980	Multi-Prog
CPP T-3	No	1980	Multi-Prog
CPP T-5	Yes	1965	NRT
CPP TB-1	No	1980	Multi-Prog
CPP TB-3	No	1985	Multi-Prog
CPP TB-4	No	1984	Multi-Prog
CPP TB-5	No	1985	Multi-Prog
CPP TB-6	No	1981	Multi-Prog

Number of buildings: 130

Distribution by decade:

1950s16
1960s 7
1970s20
1980s55
1990s29
2000s 3

Distribution by context:

NRT 23
Multi-Prog 107

Note: The Bin Sets associated with Waste Calcining are as significant as the calciner and should be documented and made part of a HAER report. These structures could be added to the published HAER ID-32-C on the Old Waste Calciner or documented in a new HAER.

Radioactive Waste Management Complex

Building	Eligible for NR	Year blt	Context
WMF 601	No	1974	Waste
WMF 602	No	1974	Waste
WMF 603	No	1977	Waste
WMF 604	No	1977	Waste
WMF 605	No	1979	Waste
WMF 606	No	1979	Waste
WMF 607	No	1979	Waste
WMF 608	No	1979	Waste
WMF 609	No	1979	Waste
WMF 610	No	1983	Waste
WMF 611	No	1981	Waste
WMF 613	No	1986	Waste
WMF 614	No	1985	Waste
WMF 615	No	1986	Waste
WMF 617	No	1987	Waste
WMF 618	No	1988	Waste
WMF 619	No	1989	Waste
WMF 620	No	1988	Waste
WMF 621	No	1988	Waste
WMF 622	No	1985	Waste
WMF 624	No	1995	Waste
WMF 627	No	1997	Waste
WMF 628-634	No	1993	Waste
WMF 635	No	1995	Waste
WMF 636	No	1996	Waste
WMF 637	No	1995	Waste
WMF 639	No	1995	Waste
WMF 641	No	1990	Waste

Building	Eligible for NR	Year blt	Context
WMF 642	No	1990	Waste
WMF 643	No	1990	Waste
WMF 645	No	1991	Waste
WMF 646	No	1991	Waste
WMF 648	No	1992	Waste
WMF 649	No	1993	Waste
WMF 650	No	1993	Waste
WMF 653	No	1993	Waste
WMF 655	No	1995	Waste
WMF 656	No	1995	Waste
WMF 657	No	1990s	Waste
WMF 658	No	1995	Waste
WMF 660	No	1996	Waste
WMF Units A, B1, B2, C	No	1996	Waste

Number of buildings: 42 + 6 = 48

Distribution by decade:

1970s 9
1980s11
1990s28

Distribution by context:

Remediation of waste: 48

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ABBREVIATIONS AND ACRONYMS

A1W Aircraft Carrier, 1st Model, Westinghouse-made
ACRS Advisory Committee on Reactor Safeguards
AEC Atomic Energy Commission
AFSR Argonne Fast Source Reactor
ANL Argonne National Laboratory
ANL-West Argonne National Laboratory-West (Idaho office)
ANP Aircraft Nuclear Propulsion Program (also ANPP)
ANS American Nuclear Society
ARA Army Reactors Area OR Auxiliary Reactor Area
ARBORArgonne Boiling Water Reactor
ARVFSAdvanced Reentry Vehicle Fuzing System

BORAXBoiling Water Reactor Experiments
BWR Boiling Water Reactor

C1W Cruiser, 1st Model, Westinghouse-made (never built)
CDC Capsule Driver Core
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERT Controlled Environmental Radioiodine Tests
CFA Central Facilities Area
CPP Prefix for buildings at Idaho Chemical Processing Plant
CRCE Cavity Reactor Critical Experiment
CUVTRCarolina Virginia Tube Reactor

DOE Department of Energy

EBOR Experimental Beryllium Oxide Reactor
EBR-IExperimental Breeder Reactor I
EBR-II Experimental Breeder Reactor II
ECCS Emergency Core Cooling System
ECF Expended Core Facility
EOCR Experimental Organic-Cooled Reactor
ERDA Energy Research and Development Administration
ETR Engineering Test Reactor

FAST Fuel Storage Facility
FCF Fuel Cycle Facility OR Fuel Conditioning Facility
FET Flight Engine Test
FETF Flight Engine Test Facility
FRAN Nuclear Effects Reactor

GCRE Gas-Cooled Reactor Experiment

HAER Historic American Engineering Record
HFEF Hot Fuel Examination Facility
HTRE Heat Transfer Reactor Experiment

ICPP Idaho Chemical Processing Plant
IET Initial Engine Test
IFR Integral Fast Reactor
ILTSF Intermediate-Level Transuranic Storage Facility
INEEL Idaho National Engineering and Environmental Laboratory
INEL Idaho National Engineering Laboratory

LCRE Lithium-Cooled Reactor Experiment
LMFBR Liquid Metal Fast Breeder Reactor
LMITCO Lockheed Martin Idaho Technologies Company
LOFT Loss-of-Fluid Test Facility
LPTF Low Power Test Facility

MWSF Mixed Waste Storage Facility
MTA Mobile Test Assembly
MTR Materials Test Reactor

NASA National Aeronautics and Space Administration
NEPA National Environmental Policy Act of 1969
NHPA National Historic Preservation Act of 1966
NPG Naval Proving Ground
NPS National Park Service
NRAD Nuclear Radiography Reactor
NRC Nuclear Regulatory Commission
NRF Naval Reactors Facility
NRTS National Reactor Testing Station

OMRE Organic-Moderated Reactor Experiment

PBF Power Burst Facility
PREPP Processing Experimental Pilot Plant
PUREX Plutonium and Uranium Extraction
PWDR Power Demonstration Reactor

RADCON Radiation Control
RAL Remote Analytical Laboratory
RCRA Resource Conservation and Recovery Act of 1976
RSTA Reactives Storage and Treatment Area
RWMC Radioactive Waste Management Complex

S1W Submarine Thermal Reactor, 1st Model, Westinghouse
S5G Submarine, 5th Model, General Electric-made (Natural Circulation Reactor)
SHPO State Historic Preservation Office
SL-1 Stationary Low-Power Reactor, first model
SM-1 Stationary Medium Power Reactor, first model
SNAP Systems for Nuclear Auxiliary Power
SPERT Special Power Excursion Reactor Test
STEP Safety Test Engineering Program

SUSIEShield Test Pool Facility OR Shield Test Pool Facility Reactor
SWEPPStored Waste Examination Pilot Plant

TAG The Arrowrock Group, Inc.
TAN Test Area North
THRITS Thermal Reactor Idaho Test Station
TRA Test Reactor Area
TREATTransient Reactor Test Facility
TRUPACT Transuranic package containers OR Transuranic package transporter
TSA Transuranic Storage Area

WCF Waste Calcining Facility
WEDF Waste Engineering Development Facility
WERF Waste Experimental Reduction Facility
WIPP Waste Isolation Pilot Plant (in New Mexico)
WRRTFWater Reactor Research Test Facility
ZPPR Zero Power Plutonium Reactor
ZPR-III Zero Power Reactor-III